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THE FOUNDRY TRADE JOURNAL IS THE OFFICIAL ORGAN OF THE INSTITUTE OF BRITISH FOUNDRYMEN; THE WELSH ENGINEERS' AND FOUNDERS' ASSOCIATION, AND THE FOUNDRY TRADES EQUIPMENT AND SUPPLIES ASSOCIATION.

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Telephone: Central 1885. Telegrams: CIRA.
The B.C.I.R.A. Scottish Laboratories are:—
Foundry Technical Institute, Meek's Road, Falkirk *(Telephone 339).*

Forthcoming Events.

SEPTEMBER 9.
South Wales Institute of Engineers:—Conversazione at the National Museum of Wales, 7.30 to 10.30 p.m.

SEPTEMBER 9-12.
Institute of Metals:—Autumn meeting at Southampton.

SEPTEMBER 14-17.
Newcomen Society:—Summer meeting at Liverpool.

Semi-Steel Castings.

Elsewhere in this issue we publish an article from the pen of "Vallishe" carrying the above title. The technical value of the contribution is virtually zero, because it compares two entities of an indefinite character—ordinary cast iron and semi-steel—but commercially it reveals a situation of an important character, and moreover, is representative of a large section of the iron-foundry industry. Ordinary cast iron is esteemed because of its cheapness and despised on account of being insufficiently standardised. In his comparison, "Vallishe" states that the average was 11.5 tons for cast iron and 14.6 tons per sq. in. for "semi-steel." Surely any well-controlled foundry can do better than 11.5 tons for ordinary grey iron. The most important part of the article is that paragraph beneath the caption "Semi-steel as a Selling Factor." It is correctly stated that it has a "distinct appeal to the average man," but nevertheless a very dangerous one, as our contributor must realise that the foundry next door can add 2 per cent. of steel and enter the market with this product as "semi-steel." Obviously "semi-steel" is no more a standard product than ordinary cast iron and it has exactly the same range of potential excellence and "rottenness." We are not at all sure that the method of expressing the material commonly known as "semi-steel" as x per cent. steel-mix cast iron is definitely satisfactory. It is certainly an honest method, but we prefer each firm branding their products with a trade name and as they improve and bring out new ones resorting to the language of the cinema. Thus, taking an established brand of cast iron like "Qualcast," we suggest that if it be alloyed with nickel, then it should be marketed as "Qualcast superior," or if, again, it be complicated by a molybdenum or chromium addition, then "ultra-superior" would be a fitting designation. We are afraid we shall have to await the further development of the moving-picture industry to supply the nomenclature for any further developments. This system has been followed in the tool-steel industry with success. The basic trade name represents in the ordinary way the normal high-speed steel; the "superior" indicates that vanadium has been added and warrants an extra price consideration on the part of the purchaser. Further adjectives often imply the presence of cobalt and a still higher cost per pound.

We strongly advise the creation by each individual firm of a series of trade names for its cast-iron products; this, associated with a united effort by everybody in the industry for the gradual suppression of the terms cast iron and semi-steel, would do much to raise the status of ferrous castings in the eyes of the engineer-buyer, besides inducing a more lucrative business.

Analytical Standards.

We have recently reviewed in our columns two reports just issued by the British Cast Iron Research Association which illustrate an important side of what may be called the public work of that body, since the reports concerned, in the interests of the industry as a whole, are obtainable by anybody.

The first concerns recommended methods of analysis. It is common knowledge that in recent years the practice of purchasing pig-iron to analysis has spread in a remarkable way; so much so that some furnaces now stock to analysis and not fracture. Also analysis is used for the control of the product in the foundry day by day. Now if a foundry purchases iron to analysis and finds that it does not conform to the specification, there is clearly room for dispute between buyer and seller, and such difficulties, unfortunately, are not rare. For two different chemists are not likely to produce the same analysis for the same sample, let alone from samples taken, perhaps, from different parts of the same melt. The differences are due in part to the heterogeneity of the material and to the personal equation of the analysts. No standard methods can overcome those. Differences due, however, to different methods of sampling and analysis in various laboratories can be eliminated by the adoption of agreed methods, and it is here that those recommended are valuable. The report gives methods of sampling and of analysis, and, where several are likely to give the same result, they are all recommended. Our only regret is that so few foundries are in a position to make use of them, because they do not have laboratories.

The other report concerns methods of the control of moulding sand, as well as research methods of analysis and grading for sands. In this report for the first time we have a set of British methods to put alongside the methods produced in America and on the Continent, and it is one on which the industry may be congratulated. There is no attempt to copy foreign methods, but, on the other hand, simplicity of operation and cheapness of the apparatus required have been kept in mind throughout. Apart from that, the methods are suited to British sand resources, and are calculated to provide a means of control which should result in great savings to the industry. There is little doubt that, if an international gathering of sand experts took place, an attempt might be made to establish agreed methods of examination of sands, just as attempts have been made to cover mechanical tests on cast iron. Great Britain could table the above-mentioned report with an easy conscience as one which would command respect and give us the right to be heard. Should the need arise to make methods of analysis of cast iron, foundry sands and other materials national standards, the existence of these agreed methods will considerably facilitate matters with the British Engineering Standards Association.

XUM

Book Review.

Automobile Steels, by Dr. Ing. A. Müller-Hauff and Dr. Ing. Karl Stein, translated from the German by Hans Goldsmidt. Published by Chapman & Hall, Limited, 11, Henrietta Street, Covent Garden, price 17s. 6d.

This book is primarily meant for American consumption, but whilst the use of the Centigrade scale is commendable from the British, the recording of the tensile figures, as 1,000 lbs. per sq. in. is a nuisance. Whilst the translation has been well done, there still remain a certain number of imperfections, such as carburising Thomas and Martin steels. (These phrases are not current in U.S.A.) Again, the translator seems to be in difficulty with the word "nach" —as he uses either "by" or "after." We suggest either its complete omission or "from" if translation is definitely necessary. However, these slight imperfections do not in any way detract from the text. The scheme of the book has been to outline the various methods of testing steel; some really simple notions of metallography. The manufacture of automobile steels is outlined in Chapter III. Here we feel we must comment on the paragraph "Open-hearth and electric furnaces," as we have failed to grasp the import of the paragraph. We imagine that reference is being made to the oxidising or pre-slagging period in the electric-furnace process, but the text is not at all clear. Again, on page 46 it is stated that "when pouring from above each ingot is filled separately. A plate of ⅜ to ½ in. thickness is placed on the bottom to prevent the entrance of foreign material." When we have used such a device when top pouring, we did so with the express purpose of reducing the bills payable to foundries for supplying bottom plates to go with the ingot moulds. If in a 10-cwt. ingot a matter of half a pound of cast iron is dissolved, the most serious impurity entering would be the carbon pickup, which would make for an increase of 0.002 per cent., a factor not so important as natural segregation. There is far too great a tendency in modern books to run over each phase anent the subject under consideration and devoted between 10 and 50 lines to the subject. This vignette system may suit the style of Aldous Huxley, but it detracts from the value of technical books, because students search an index and receive only the sketchiest impression of really important matters. However, in this respect the book is no worse nor better than most modern works. Continuing with the scheme of the book, Chapter IV deals with the common carbon steels and their utilisation, and, *inter alia*, deals with steel castings. The word "annealing" is ill-chosen when applied to the heat-treatment of steel castings for grain-refinement purposes. The balance of this chapter deals with the case-hardening process and special steels. We were interested to learn that "Krupp was the first to use rust-resistant steel, and even before the war knew the effect of a high-chromium content in increasing the rust resistance." Somehow or other we have always associated the name of Brearley with development, and, after a close examination of much evidence, we are so confirmed in this view that we confidently believe that it will be accepted as the truth in the last analysis. Chapter V is extremely useful, and checks up fairly well with British practice; the preponderating use of chromium and nickel and the neglect of vanadium and molybdenum is characteristic of European usage. Chapter VI outlines the standards, both American and German, for automobile steels, but no personal views are given as to whether such action is desirable. Whilst we have an open mind, we are always just a little afraid that retrogression, or at least impaired progress, may result. Chapter VII illustrates, without description beyond two or three lines beneath each picture, a number of characteristic failures. The last chapter is devoted to the composition of various automobile parts as specified by the various companies throughout the world. The only British one detailed is Morris Motors, Limited. It is interesting to note that Ford has standardised on nickel cast iron for pistons and cylinder block and head, whilst Cadillac uses 0.35 molybdenum cast iron for its pistons. Wanderer Werke, in Germany, specifies for its cylinder blocks T.C. 3.25, Si 1.45, Mn 0.87, S 0.097, P 0.27, Ni 0.65, Cr 0.30 and Cu 0.07 per cent., with a Brinell number of 220. The Austrian concern, Steyrwerke, insist on their cylinder blocks conforming to the German D.I.N. specification Ge 2691. Peugeot, the French company, use a straight, low-carbon, medium silicon (1.5 per cent.) cast iron, with a 228 Brinell number. The book contains over 200 pages, is well illustrated and excellently indexed.

Publications Received.

Notes on the Hardness Testing of Materials. —Issued through Wild Barfield Electric Furnaces, Limited, Elecfurn Works, North Road, Holloway, N.7.

This publication deals in a proper scientific manner with the Vickers hardness tester. This machine, it will be remembered, utilises a diamond pyramid instead of a hardened ball as is the case with the Brinell test, and a comparison is made throughout the pamphlet of the real meaning and relative value of the results derived from the two machines. It forms a really interesting and useful study, and one with which every metallurgist ought to be familiar. It is placed at the disposal of our readers on request to the issuing company.

Reactivity of Coke—No. 3. The Influence of Iron Compounds, by J. H. Jones, Ph.D., J. G. King, Ph.D., and F. S. Sinnatt, D.Sc. Published under the Authority of His Majesty's Stationery Office. Price 9d. net.

This important pamphlet, of 42 pages, discloses how iron in coke, and the form in which the iron is present, has a marked and probably a predominating effect on the reactivity. Metallic iron is shown to increase the reactivity. The investigation is due to the co-operation of the Department of Scientific and Industrial Research and the National Federation of Iron and Steel Manufacturers.

Correspondence.

[*We accept no responsibility for the statements made or the opinions expressed by our correspondents.*]

Briquetting Steel Turnings.

To the Editor of The Foundry Trade Journal.

Sir,—In the issue of The Foundry Trade Journal of August 21, Mr. M. Escher in his letter refers to briquetted steel turnings. The writer would be obliged if any reader could outline a briquetting process for steel turnings, with type of machine and its probable cost. The briquettes must be a suitable size for cupola melting and mixing with pig-iron and cast-iron scrap.—Yours, etc.,

S. G. S.

[We, too, are interested in the above inquiry, as during the war we installed a briquetting machine of either American or Canadian origin. Whilst it functioned very satisfactorily, with the turnings available at the showrooms, it certainly would not briquette those supplied through the scrap merchants to the foundry. It should be recognised that "steel turnings" may range from a powder to spirals of undreamt of length and of unbelievable elasticity and from wrought iron to complex alloy steel.—Editor.]

Random Shots.

Talking of railways once more, a jaundiced traveller might suggest that a few of the directors travel as ordinary passengers for a time. Can we believe that railway telegraph offices would be so depressingly early-Victorian if the service were run as a service to the travelling public? Or that there is no demand for post offices at the large termini? Or that passengers really like the waiting-room and other facilities? Or that modern needs correspond with the duplicate provision of waiting-rooms for third- and first-class passengers, men and women? What about the appalling inconvenience suffered by those who have to travel on Sunday? They have learned for many years to avoid, if humanly possible, committing such a heinous crime, but what if they must? At present the answer is, make them travel as slowly as possible and have waits at junctions as long as possible, and if they want anything to eat or drink, don't let them have it. If they must telegraph anybody, charge them extra. That soon larns 'em!

* * *

I was interested in a scheme advanced by Sir Joseph Calvert, of Middlesbrough, for assisting the unemployment problem in his area. The scheme, broadly, is that the demand for pig-iron is bound to increase in future; that is part of the theory that an improvement is bound to take place soon, as we are touching bottom just now. Therefore give credit to the blast-furnacemen to enable them to put furnaces into commission and make pig-iron for stock. Ten furnaces in the Cleveland area relighted would employ about 8,000 men. The Government would save in unemployment pay about half-a-million in a year, and this amount would apparently suffice to meet the need, so that the Government would in reality lose nothing.

* * *

We have all heard of perspicacious iron-masters in the past who have put pig into stock during lean times and even made it into wads, digging it up during boom periods and selling at a handsome profit. Only to-day there does not seem to be anybody with the necessary capital to lock up. And if pig-iron, why not castings, which also do not markedly deteriorate on being kept in stock a year or so? I scarcely think Government experiments, here and abroad, in textiles, rubber, wheat and other commodities, will encourage the idea.

* * *

For a holiday month—August is the holiday month for the majority of us, the "take-your-holidays-earlier" movement notwithstanding—I seem to have been a little serious. Here are a few stories that I hope are new to salesmen.

* * *

"Our man Smith booked a ten-thousand-pound order this morning."

"I can't believe it, in these times."

"It's true—I can show you the cancellation."

* * *

The chief was busy and had been interrupted several times. "Can't you read?" he asked the next intruder. "The sign on that door means 'private.'"

"I know, and I am glad it's there," said the calm young traveller. "If there is anything I hate, it is being disturbed when I'm talking to a valuable customer."

* * *

"You are aware that this situation demands a knowledge of double-entry book-keeping?"

"Indeed I do. At my last place I had to do triple entry—a set for the active partner showing the real profits, a set for the sleeping partner showing small profits, and a set for the income-tax people showing a loss."

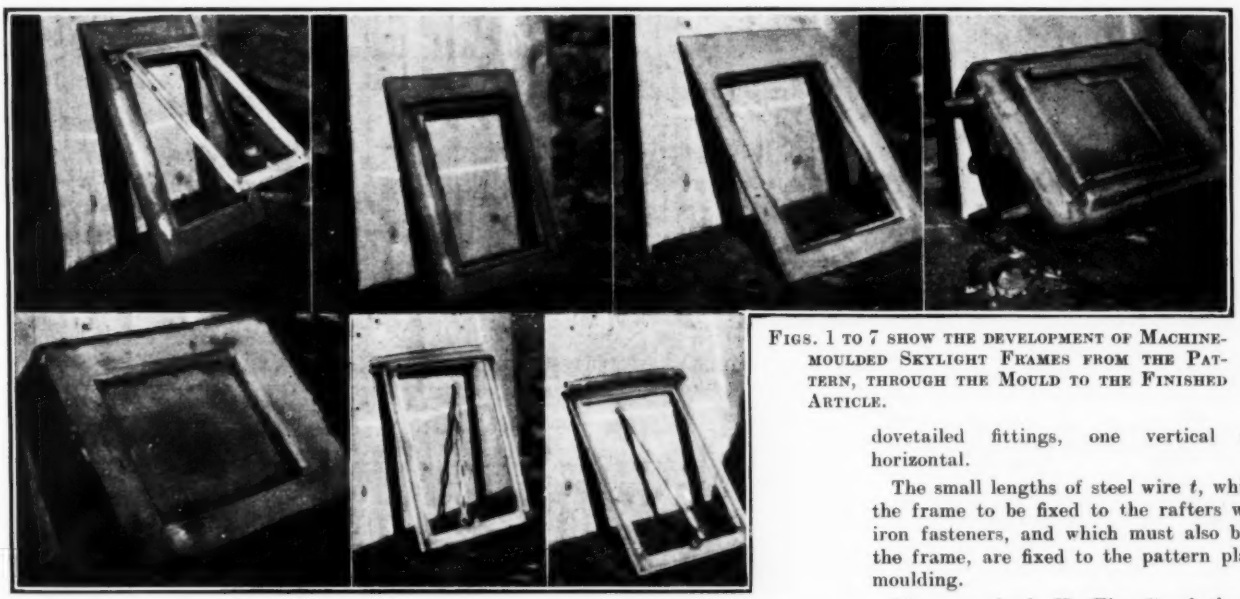
Marksman.

Manufacture of Skylight Frames for Slate Roof with Watertight Joint, Machine-Moulded at the Usines & Fonderies de St. Ouen-Vendôme.*

By H. Magdelénat.

Description, Weight and Dimensions.

The watertight A3 cast-iron skylight frame consists of three parts: the frame, the sash, and the fastener (Figs. 1 to 7). In this watertight arrangement the sash, which has its upper part curved, fits into two bearing pins N (Fig. 8) sunk in the frame, the whole forming a hinge. This hinge is protected by a guard L, integral with the frame and preventing the entrance of water between sash and frame. The fastener is attached to the sash by a cored hook C (Fig. 9), and a hook H (Fig. 8) on the frame enables the opening of the skylight to be regulated by means of the holes in the fastener. The total weight of the three parts is about 25 lbs. The length is 28, the width 21, and the average thickness $\frac{1}{8}$th in.



FIGS. 1 TO 7 SHOW THE DEVELOPMENT OF MACHINE-MOULDED SKYLIGHT FRAMES FROM THE PATTERN, THROUGH THE MOULD TO THE FINISHED ARTICLE.

Manufacture of Pattern Plates.

The pattern plates used for the cash and frame are composed of cast-iron frames, high-strength plaster and white metal. The pattern plate for the fastener is double-faced, and entirely of cast iron. The pattern plate for the sash and frame are both made by the same process.

Metal and Sand Used.—(*a*) *Metal.*—In the final analysis the hot metal used showed the following composition:—T.C., 3.09; C.C., 0.43; Si, 1.88; Mn, 0.39; S, 0.02, and P, 1.30 per cent.

(*b*) *Sand.*—The new sand from the Fontaine Raoult pits showed the following contents in the final analysis:—SiO_2, 88.24; Al_2O_3, 3.94; FeO, 7.80; CaO, absent; alkalis, absent; MgO, trace; water, 4.04; and loss on ignition, 1.89 per cent.

The sand is prepared by a Baillot automatic sand plant, in the following proportions:—New sand, 20 per cent.; dry or burnt sand, 25 per cent.; old sand, 55 per cent.; mineral blacking, 2.5 per cent.

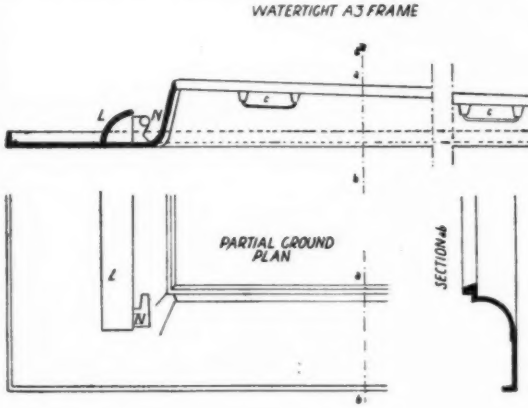


FIG. 8.

Moulding.

(*a*) *Frame.*—This is moulded on a R3 Bonvillain & Ronceray hydraulic turnover machine and another A3 machine of the same make, with moulding boxes 62 cm. by 84 cm. The turnover machine is necessary to obtain the lower parts, owing to the presence of the detachable guard (see Fig. 6).

(*b*) *Sash.*—This is moulded on the ordinary Marillier hand machine, D3 type. The moulding box is 64 cm. by 72 cm.

(*c*) *Rack or Fastener.*—Moulded on a D2 Marillier machine. The moulding box is 54 cm. by 36 cm., with eight castings in the mould.

General Notes on the Moulding.

The detachable guard L (Fig. 8) is fixed to the pattern plate with two pins, and to secure it firmly there is a small support on the pattern plate, which must be filled up again in the mould before the guard is withdrawn.

The two bearing pins N (Fig. 8) sunk in the frame are fixed on the pattern plate by two dovetailed fittings, one vertical and one horizontal.

The small lengths of steel wire *t*, which enable the frame to be fixed to the rafters with strip-iron fasteners, and which must also be sunk in the frame, are fixed to the pattern plate before moulding.

The open hook H (Fig. 8) of the frame is integral with the latter, the joint passing along its axis.

The hook C (Fig. 9) of the sash is sunk and fixed to the pattern plate before moulding.

The four lugs O of the sash are pierced with a 3-mm. hole, obtained with small wooden "Robéches" cores.

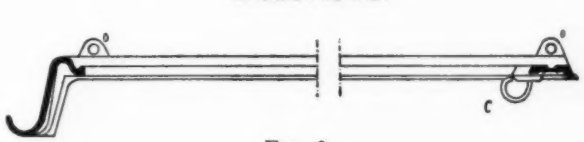


FIG. 9.

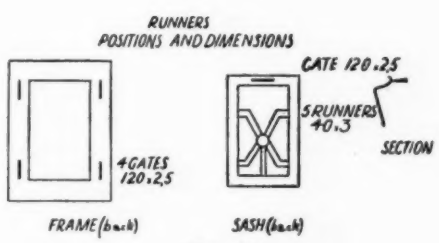


FIG. 10.

Comparison with Hand Moulding.

Machine Production.—From 22 to 25 frames are obtained with two men in a half-day of 4 hrs., and from 35 to 38 sashes under the same conditions. An average of 12 complete frames per man per day is therefore obtained.

Hand Production.—In practice the A3 skylight frame is not moulded by hand, that method being reserved for larger dimensions.

* Part of a Paper presented on behalf of the French Foundry Technical Association to the Middlesbrough Conference of the Institute of British Foundrymen.

By hand moulding, however, six or seven complete frames could be obtained per man per day.

Conclusion.—A machine moulder, therefore, produces twice as many complete frames as a hand moulder. It is interesting to note, however, the cost of production of this A3 frame moulded by hand and by machine differs by only a few centimes, the cost of labour in the two methods of work being as 85 to 100. This

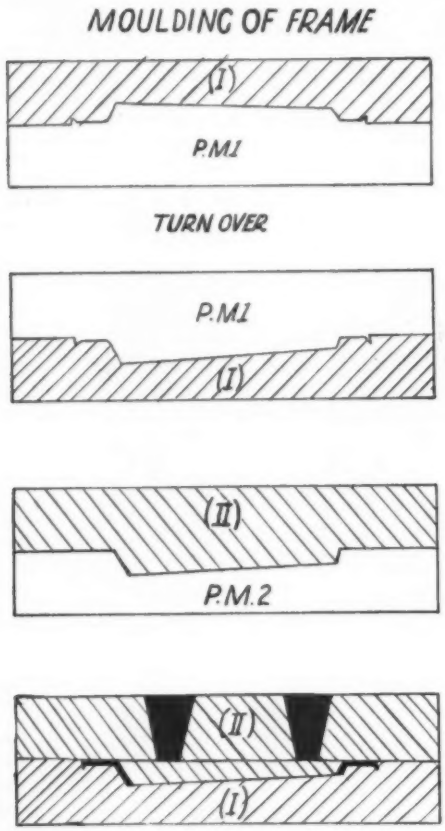


FIG. 11.

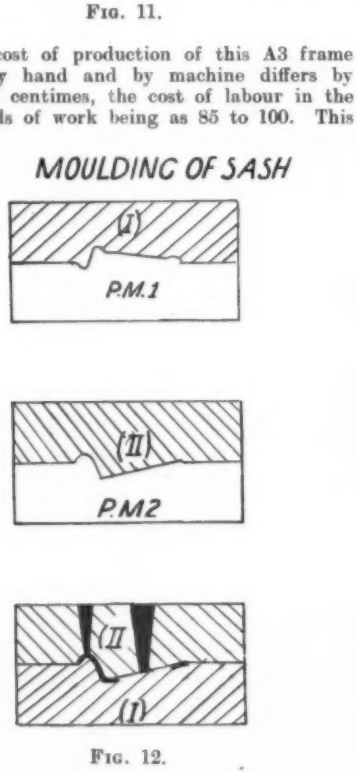


FIG. 12.

goes to confirm the frequently observed fact that moulding machines operated with higher direct overhead charges give a larger output, but without always reducing the cost of production.

Cleaning, Trimming, Accessories and Assembling.

Assembling.—

Cleaning.—This is still done by hand with a wire brush. This work is paid for at 2s. 1d. per ton.

Trimming.—This is done with hammer and file, the work being paid at the rate of 2s. 10½d. per ton.

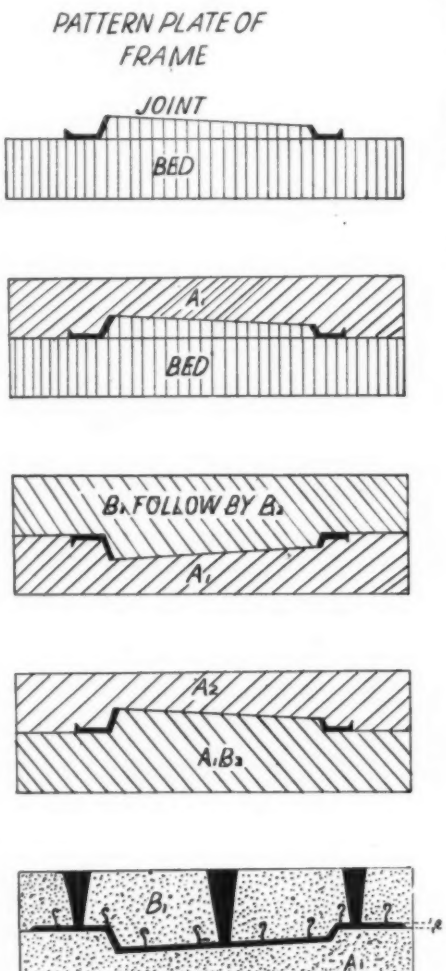


FIG. 13.

A_1 and B_1 are cut to one thickness e. Metal is poured into A_1 and B_1 assembled, and into A_2 and B_2 assembled. The sand is removed from B_1 and A_2, and plaster is poured in.

Accessories. — Two cast-iron bearing pins moulded in 35-cm. by 35-cm. box, 56 per mould, 140 moulds per two men per day; four bent-iron wires (3 mm.); four strip-iron fasteners (4 mm. by 1 mm.).

Assembling and Preparing for Despatch.—From 15 to 20 per man per hour.

Contracts Open.

London, S.E., September 17.—1,071 steel tyres, 441 crank and straight axles, 46 copper plates, 46,710 steel boiler tubes, etc., 398 vacuum cylinders and mild-steel buffers and spare parts for locomotives, for the India Store Department, Belvedere Road, Lambeth, London, S.E.1. (Fee 5s., non-returnable.)

Thirsk, September 6.—Water mains, etc., for the Rural District Council. Mr. F. Metcalfe, sanitary surveyor, Thirsk. (Fee £2 2s., returnable.)

Workington, September 8.—Steel mains with welded joints, cast-iron spigot and socket mains and specials, with lead-caulked joints, for the Town Council. Mr. H. Hoy, engineer and manager, Gasworks, Stanley Street, Workington.

Continental Steel Syndicates.

Production of the Cartel Countries.

The production of the countries belonging to the Continental Steel Cartel during the first half of the current year totalled 15,470,500 tons, or 2,050,500 tons less than in the corresponding period last year. The production figures of the individual countries were:—Germany, 6,581,000 tons (against 8,328,800 tons); France, 4,830,000 (4,814,000) tons; Saar area, 1,042,600 (1,087,400) tons; Belgium, 1,822,000 (1,980,000) tons; and Luxemburg, 1,194,000 (1,315,727) tons.

Since December last the production has been steadily decreasing, except in France, where there is still a good demand in the home market. Germany, it is expected, will receive a considerable compensation payment for having exported less than her quota permits.

Wire Rods and Wire.

It is announced that the next meeting of the Continental Wire Rod Syndicate will take place at Liége on September 11. The general situation of the market is to be discussed, together with the question of a possible change in prices.

The prospects for the re-establishment of the former international understanding in the wire branches have improved now that the Belgian Tréfileries et Clouteries de la Paix have entered into an agreement with the Ougrée-Marihaye Company and the Arbed in regard to the sale of wire products in the Belgian-Luxemburg markets. The collapse of the Wire Products Syndicate last year is said to have been due to the outside competition of the Belgian works in question. With the new agreement, however, the reorganisation of the Belgian Syndicate and the International Syndicate will be facilitated.

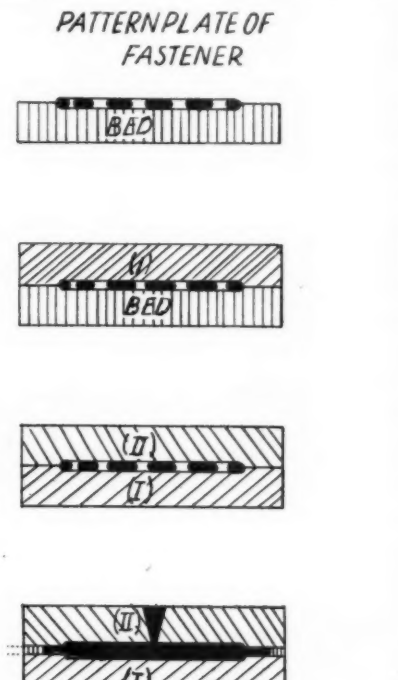


FIG. 14.

The distance between the dotted lines on the extreme left of the bottom sketch represents the perimetric surplus in sand, giving thickness of double-sided pattern plate.

A GOOD LUBRICANT for the threads of bolts can be made from 33 parts tallow, 23 parts white lead, 3 parts graphite and 41 parts neutral oil. This will prevent torn or stripped threads, which is liable to occur where the male and female parts of the threads come together with great pressure. It will prevent the threads rusting and make them easier to undo.

Sand-Spun Cast-Iron Pipes.

The latest and most interesting development at the Staveley Works of the Staveley Coal & Iron Company, Limited, is the erection of a large plant for the manufacture of cast-iron pipes in sand-lined moulds by the centrifugal process. The pipes will be 4-, 6-, 8-, 10- and 12-in. sizes, of the socket and spigot type, and will be in 16-ft. lengths.

The advantages of this process are that there is no possibility of the pipes being chilled, and, therefore, annealing is unnecessary, as the pipe is cast in a sand-lined mould, somewhat similar to those used in the ordinary vertical sand-cast process. No cores are employed, as the centrifugal action throws the molten iron against the wall of a rapidly-revolving flask or mould, this mould being lined with sand. The centrifugal action puts the molten iron under a pressure of 75 lbs. per lb. of metal, and so renders it homogeneous and close-grained.

The amount of iron required to form a pipe of any given dimensions is calculated in advance, and this exact amount is poured into the mould and is distributed uniformly throughout the mould by the centrifugal force. The pipes are not removed from the flasks or moulds while showing any colour of heat, so that the gradual cooling eliminates strains.

Strength of Sand-Spun Pipes.

The additional strength gained by the sand-spun process produces pipes of increased tensile strength, toughness and elasticity for a lesser thickness of metal. This saving of weight allows a 25 per cent. greater length of pipe to be laid for the same tonnage of pipes used. An additional saving is made by using 16-ft. length pipes. owing to the reduced number of joints required, and as sand-spun pipes are lighter than the standard vertical pit-cast pipe, handling and transport charges are materially reduced. Another advantage of this process is that no metal is wasted in gates, runners and runner basins, and head metal.

Moulding Methods.

As already mentioned, the sizes of pipes made in this new plant will be 4 in., 6 in., 8 in., 10 in. and 12 in. in 16-ft. lengths. The plant will work continuously. The flasks or moulds are placed in the gantries in front of each of the jolters, these being four in number. The flasks are rolled on to tilting tables, which place the flasks in a vertical position on top of the jolters, at the same time lowering them on to the head patterns which forms the socket of the mould. The pattern is lowered into the flask and seated on the head pattern at the bottom, and a special guide is put on the top to keep it concentric with the flask.

The sand is filled into the flask from revolving sand bins, and the flasks are then jolted. After jolting, the spigot end is made up by a special beading tool, the pattern withdrawn by special pattern hoists in the roof of the building, and the tilting tables then lift the flasks vertically off the head patterns. A blacking dish is put on each flask, and a bucket of blacking poured down the centre of the mould. The dish is so designed as to make the blacking flow evenly round the inside of the mould, the surplus being caught in a pan at the bottom and returned by pump to the top, where it is used again.

Drying and Casting.

The top plate is now put on in order to form the end of the pipe, the tilting tables lowered down so that the flasks lie in a horizontal position, and are rolled off along the gantries to be dried. The drying is done by gas burners blowing a flame alternately through each end of the flask, and takes about five to fifteen minutes according to the size of the mould. The flasks are then lifted by crane, two at a time, and placed in front of the spinning machines, or twisters.

There is one man working each spinning machine, and he first inspects the mould and then places the socket core in position. The socket cores are made of oiled sand in special machines, and here the sand is automatically prepared and served to the core-making machines. The cores are then dried and blacked ready for use. The spinning machines are designed to spin the flasks at a constant speed while the metal is poured in from one end. There is an automatic arrangement which rolls the flask into the machine and out again after it has been spun.

Cooling and Stripping.

Each spinning machine is provided with a safety hood. This hood is supported on plungers and may be raised by hydraulic power to permit the entrance of the flask for pouring, and its removal after spinning is complete. The mould is spun for a period of 2½ to 5 min., according to the size being made. As the flasks are removed from the machines they are placed, two at a time, on a cooling gangway about 120 ft. long. They roll down this gantry at the rate of 2 ft. a minute, this allowing a period of about an hour in which to cool. At the end of this gantry the flasks are placed in an air-tight box kept at less than atmospheric pressure, and here a blowpipe is put through the mould, liberating the sand by means of compressed air.

The flasks are rolled out of this box on to a stripping table, two flasks being accommodated at the same time. This table holds the flasks in position while hydraulic rams push the pipes out of the flasks on to a transfer carriage, which conveys the pipes to the finishing gantries. The stripping table is then tilted and the sand in the flask, now, of course, quite loose, falls into a receiving bin below the floor level. The flasks are then lifted out by a crane and placed ready on the gantries before each tilting table, and so the process continues.

Sand Reconditioning and Distribution.

Having been collected in the bin beneath the strippers, the sand is fed into a shaker conveyor, the end of which goes into a cooling drum, through which a current of air takes away the foreign matter, such as burnt clay and fine dust, from the sand. Out of this cooling drum the sand is passed into a dry-sand storage bin, by means of an elevator, on its way passing through a screen which removes any lumps or foreign matter in the sand. From the storage bin it falls into a measuring hopper, where new sand is added, and this is delivered straight into a large Smith mixer. Clay wash is added in the required quantities to restore lost bond. From this mixer it passes into a Simpson mill, and is again mixed, gaining further bond by means of the kneading action of the mill. From here it is lifted into a storage bin for tempered sand, whence it is distributed by elevators and conveyors to the bins above the jolting machines.

The pipes, when taken from the strippers, pass down three gantries for cleaning, inspection, dipping and despatch. On each gantry the pipes first go on to grinders where any flash is removed, or any inside roughness, then into washing machines and washed under pressure, and at the same time thoroughly cleaned and brushed outside to remove any sand or dust. Each pipe is then weighed separately and passed into a testing press, where they are all tested to a pressure of at least 600 lbs. per sq. in. irrespective of class. At the same time they are well hammered by hand while the pressure is on to ensure absolute soundness. From the presses they go into horizontal heating ovens, and are heated prior to being dipped, and from the dipping tanks they are loaded by a travelling crane, direct into wagons or lorries for transport.

Melting Plant.

There are three cupolas for melting the iron, each cupola working 24 hours at a time, the capacity of each being 10 to 12 tons per hour. These are of improved design to give iron of a constant temperature and mixture, and to enable them to be kept clean for a long period of work. They are charged by mechanical means, an overhead travelling crane handling the iron by means of a lifting magnet from the wagons on to a tilting table, on the charging platform of each cupola. This table directs the iron straight into the cupola. The coke is fed into bins, which are placed on the tilting table in a similar manner. Another overhead travelling crane handles the molten iron from the cupolas by means of special ladles into the spinning machines. A laboratory will be attached to the plant to test and control the iron, sand, dipping materials, etc.

The plant has been designed on American lines under licence from the Sand Spun Corporation, in order to give the greatest possible output, consistent with highest quality of work. The plant will eventually work continuously for 24 hours per day. Pipes will be produced at the rate of one per minute approximately, which gives a tonnage of 10 to 12 tons per hour, or 1,200 to 1,500 tons per week.

The building, housing the sand-spun pipe plant, designed, constructed and erected by Markham & Company, Limited, Chesterfield (a subsidiary company of the Staveley Coal & Iron Company, Limited), is 420 ft. long, 200 ft. wide, and about 72 ft. high, consisting of the main shop and several auxiliary bays.

Handling Facilities.

The main shop has one 7½-ton travelling crane on 44-ft. 6-in. centres of crane track, being 45 ft. from the ground level. Above this crane track are placed the four special hoists for lifting the patterns from the flasks. This shop also contains the socket-core-making plant, the jolters, sand feeders and hydraulic accumulator. An adjoining bay contains three 10-ton cranes on 57-ft. 7-in. centres of tracks, at 30 ft. height above ground level. This bay houses the tilting tables, spinning machines, mould-drying gantries, flask-cooling gantries, stripping table and flask-storage cellars.

A further bay adjoins the cupola loading gantry, and has a 7½-ton crane, 37-ft. 2-in. centres of tracks, 25 ft. from ground level. In this bay are the hydraulic pipe strippers and sand-preparation plant. It also covers the cupola tapping holes and spouts from which the iron is taken to the spinning machines. Adjacent to this bay are the three cupolas, these cupolas being supplied with the necessary material by two 5-ton cranes operating on tracks 55-ft. centres, at a height of 45 ft. The storage bunkers are also arranged within reach of these same cranes.

On the opposite side of the main bay are three pipe-inspection shops, each 30 ft. by 40 ft. ground space, and three shops in which the pipe-dipping or coating plants, each of these shops being 33 ft. by 60 ft. Outside the pipe-dipping shops is a loading gantry, with a 3-ton overhead travelling crane for loading finished pipes.

Power, Lighting and Ventilation.

The electrical power, approximately 1,200 horse-power, is supplied from the sub-station situated near the main building, the initial supply being from the Staveley Company's Devonshire Works Power Station. The whole of the buildings are covered, on the roof with Robertson's protected metal, and on the sides with "Big Six" asbestos corrugated sheets, excepting the sub-station, which has brick-panelled walls. The wall of the building adjacent to the cupolas is covered with Armco rustless iron sheets. Ventilation is by Robertson's Patent Ventilators and Mellowes glazing is used for the roofs and sides, for lighting.

The total weight of steelwork used for the building is approximately 1,600 tons, while about 15,000 tons of concrete have been absorbed in the foundations and cellar walls. As before mentioned, the building is supplied and erected by Markham & Company, Limited, who are also manufacturing the greater portion of the requisite machinery for the plant.

D

Large Bellmouth Entrance for Hydro-Electric Culverts.

By Our Engineering Correspondent.

We are able to reproduce below photographs of two very large cast-iron bellmouth entrances for 8-ft. 6-in. diameter pipes in connection with a well-known hydro-electric scheme in India, which have been constructed by Messrs. Glenfield & Kennedy, Limited, of Kilmarnock, and are shown assembled in their shops.

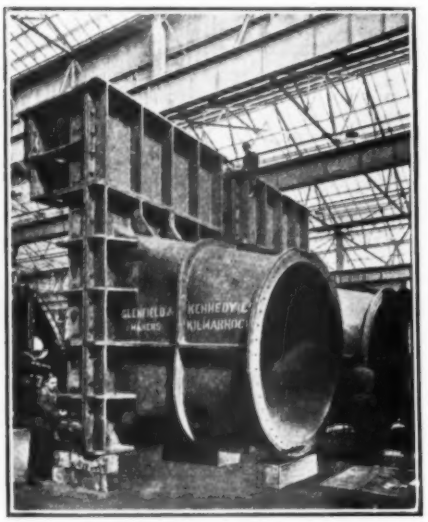


Fig. 1.—Two large Bellmouth Entrances for 8-ft. 6-in. dia. Pipes, constructed by Messrs. Glenfield & Kennedy, Limited.

This scheme involves the construction of a dam 175 ft. high, which on completion will impound a lake having a water surface of 59¼ sq. miles, with a capacity of 33,500,000,000 cub. ft., for the irrigation of 30,000 acres of land. Because of the head and the volume of water available, four turbines are to be installed

Fig. 2.—The same Bellmouth Entrances, viewed from a different position.

for the generation of electricity, and the dam is accordingly pierced by four culverts with pipes 8 ft. 6 in. diameter, each provided with a corresponding turbine.

In connection with this scheme a large contract was awarded to Messrs. Glenfield & Kennedy, Limited, which comprises some highly interesting equipment, including, for example, 29 large sluice gates, an entirely new design of emergency roller sluice gate and mechanically-operated needle valves and jet dispersers.

The construction shown in the photograph is a special taper casting weighing 16 tons, for coupling to the 8-ft. 6-in. diameter pipe at one end, and at the other to fit a rectangular opening which will be connected to an emergency gate well, into which is to be lowered a special new design of emergency roller gate to cut the particular culvert out for examination or repair. At the other side of this gate are short connections to the face of the dam leading to inlets of rectangular cross-section, each with double screen 25 ft. high by 7 ft. wide.

The dam is pierced with 8 inlets leading by way of the special bellmouth entrances and other connections to four 8-ft. 6-in. diameter pipes supplying the corresponding turbines. It is interesting to note also that during the building of the dam and until the power house is constructed, four "Glenfield" 102-72-in. needle valves will be fitted on the ends of the pipes to take the place temporarily of the turbines, equipped with 72-in. effective diameter jet dispersers, each of which will pass 2,000 cusecs of water under a head of 180 ft., so that the impounded water can be passed down the river without difficulty until the turbines are operating, all the energy being harmlessly dissipated by the dispersers, forming a vast spray of billions of water particles, each cushioned by the air resistance, instead of a solid bore of water.

Working High-Chromium-Nickel Steels.

In the course of an article in a recent issue of "The Iron Age," Mr. Curtis C. Snyder deals with the working of high-chromium-nickel steels, principally that known as the "18 and 8" variety or Ka-2. In connection with pickling, he points out that the simplest is a 6 to 8 per cent. sulphuric-acid solution, to which about 10 per cent. rock salt has been added, the purpose of the rock salt being to liberate hydrochloric acid. This solution should be used at 55 to 65 deg. C. When the scale has been loosened, the article should be scrubbed and then immersed in a solution of 20 to 30 per cent. nitric acid at 55 to 65 deg. C. for 10 to 20 min., after which it should be washed in warm water. The nitric-acid dip will brighten the surface of the metal.

Another method is to use 8 per cent. sulphuric acid and 2 per cent. hydrochloric acid at 55 to 65 deg. C., followed by scrubbing, a nitric-acid dip and final washing. One of the best methods is to make a solution, 40 per cent. by volume of hydrochloric acid and use it at a temperature of 55 to 65 deg. C. This solution, while slightly more expensive than the others, is less likely to cause pitting, and will impart a fine, smooth grain texture to the surface. Inhibitors should be used with all solutions.

The nitric-acid tank may be of wood and lined with 16 to 18 per cent. chrome sheets. As nitric acid does not attack the alloy, the life of the tank should be practically indefinite. In the sulphuric- and hydrochloric-acid tanks a good resistant brick should be used, set with acid-resisting mortar, or a steel tank lined with vulcanised rubber.

In deep drawing, the high-chrome-nickel alloy has a tendency to gall and score the dies unless proper precautions are taken. Ample clearance should be allowed between the metal and the dies, usually twice the clearance provided with ordinary steel or brass. Shops which have allowed 10 per cent. of the gauge for clearance in drawing ordinary steel sheets have found it necessary to provide a clearance of 15 to 20 per cent. of the metal thickness with Ka-2. Chromium-nickel cast-steel dies have been used successfully in drawing this alloy.

Certain lubricants have been developed, which have aided greatly in the rapid strides made in drawing articles of stainless steels. One of these is a compound, using lithapone as a base, mixed with linseed oil, to which is added a small amount of talc, after which it is thinned, if necessary, with naphtha or benzene. The lithapone is used about half and half with the oil. Lithapone is a compound of zinc oxide and barium sulphate.

Another compound in which lithapone is used as a base is a mixture of lithapone, pale paraffin oil, No. 2 cup grease, flour of sulphur and talc.

When several operations are required in drawing an article, it is at times necessary to anneal between the draws. When this is done a temperature of 1,060 to 1,170 deg. C. should be used to ensure maximum ductility. Presence of any of the three drawing compounds described will have no detrimental effect on the surface of the metal during annealing. If a white- or red-lead compound is used it is important that it be completely removed before annealing, as it has a rotting action on the stainless alloy as well as on ordinary steel at high temperatures. Disastrous results were encountered many times in the early stages of stainless-steel development through the use of lead compounds which were improperly removed before annealing.

In certain cases, where there is excessive drawing on heavy-gauge sheets, severe strains are set up as a result of the cold-working properties of Ka-2, and precautions must be taken to prevent cracking following the drawing. Cracking may not occur for several hours after, and to avoid any possibility of it the drawn article should be given the annealing treatment at once.

In processing Ka-2 three general rules are important to bear in mind:—It should be annealed at 1,060 to 1,170 deg. C. to secure maximum ductility and corrosion resistance; pickling should be by the use of sulphuric or hydrochloric acid, or a mixture of both, followed by a nitric-acid dip and thorough washing; and dies should be given ample clearance, and special drawing compounds used.

Lancashire Foundrymen's Outing.

Members of the Lancashire Branch of the Institute of British Foundrymen had a successful outing to Hope, Derbyshire, on Saturday, August 16. The weather was ideal, and about 24 members, accompanied by their ladies, left Manchester by motor-coach shortly after lunch for Hope, proceeding by way of Chapel-en-le-Frith, Sparrow Pit, Peak Forest, Grindleford and down the famous Surprise View, which affords one of the finest views in Derbyshire. Thence, by Hathersage, the party arrived at the Rising Sun Hotel at Hope, where an excellent dinner was served.

Mr. Rowland W. Stubbs (the Branch-President) expressed the hope that they had enjoyed the outing, as apparently they had, for it was the intention of the Lancashire Branch Council to develop the social aspect of the Institute and organise more gatherings of this character. Next year he hoped the Branch would have twice as many members present at the picnic.

Mr. R. A. Miles (Past-President) moved a vote of thanks to the Committee for carrying out arrangements for the picnic. This was carried unanimously, and Mr. E. Flower responded on behalf of the Committee.

The return journey was made by way of Castleton, the famous Winnats Pass, Man Tor Mountain and Whalley Bridge.

Where greases are used for lubrication, the addition of a small amount of graphite will improve its wearing properties and increase its body. A 5 per cent. graphite addition is sufficient. The grease should first be melted, then the graphite should be added and well stirred in.

Value of Analysis and Specification for Core Oils.*

By J. A. Gitzen.

During the past four years several technical Papers have been presented before various technical societies, dealing with the subject of core-oil analysis. Unfortunately, opinions are divided on this subject. H. L. Campbell, who has made a study of the chemical analysis of commercial core oils along with linseed oil, in one of his Papers† draws the conclusion that purchasing core oils on chemical analysis is not as safe a procedure to follow as the old method, namely, purchasing them on a strength basis, such as produced in the core when baked. On the other hand, V. A. Crosby‡ and R. D. Wysong§ in several Papers show that, with the proper laboratory control, core oils can be purchased successfully and controlled absolutely by buying on chemical specifications. The author will attempt to prove further that it is not only possible to purchase core oils on this basis, but that it is the only procedure to follow by the foundries.

TABLE I.—*Chemical Specification for Core Oil.*

Specific gravity at 60 deg. Fah. ..	0.9368 max.
Flash point (Cleveland open), deg. Fah.	165 to 200
Fire point (Cleveland open), deg. Fah.	190 to 225
Viscosity at 100 deg. Fah. (Saybolt) ..	155 max.
Iodine number (Wijs—1 hr. absorption)	154 min.
Saponification number	136 min.
Acid number	38-44
Ash	10 max.
Colour	Light clear amber through ½-in. section.
Fish oil	Negative (Griffin test)
Gallonage	U.S. liquid gallon at 60 deg. Fah.

Purchasing Core Oils by Chemical Analysis.

There are few foundries that do not buy their pig-iron, sands, coke, etc., on chemical analysis. These same foundries, however, not so many years ago purchased their raw materials much on the same basis as they are purchasing core oil to-day. Has not chemical analysis on the above-mentioned raw materials improved foundry practice tremendously? This, being quite generally conceded, should prove that chemical analysis covering all raw materials used in the foundry is certainly a step in the right direction. Core oil being one of the important raw materials that enters into the making of good castings, upon its uniformity and quality depend more or less the percentage of scrap and general casting results obtained.

TABLE II.—*Core-Oil Formula for Chemical Specification of Table I.*

Linseed oil (raw), per cent.	50
Rosin (H grade or better), per cent. ..	25
Kerosene (water white), per cent. ..	25

TABLE III.—*Minimum Linseed Oil Allowance for Core Oil (Chemical Specification of Table I).*

Linseed oil (raw), per cent.	49
Rosin (H grade or better), per cent. ..	27
Kerosene (water white), per cent. ..	24

The author has had the opportunity during the past five years to observe the practice of a great many foundries, and it is quite generally admitted among many foundrymen that any trouble that develops in the core room usually reverts to the core oil used, whether the latter is at fault or not. Core oil is the unknown in their core practice, and it is only natural that it should be blamed for all troubles. In the majority of foundries when core troubles arise, the core oil that is being used at the time is unjustly thrown out and a new core oil purchased; in a great many cases two or three different oils are tried and still the trouble continues. Finally, however, the trouble is discovered, either in the sand, ovens or somewhere else, but not in the oil. Had the core oil been purchased on specification all of this trouble, loss of time, and poor castings would have been eliminated, because checking the core oil by chemical analysis would have informed the core room immediately that the trouble was from some other source.

Specifications for Core Oils.

The question naturally arises, what would be the proper specification on core oil that should be used in practice? This depends more or less upon the individual foundry. But, whatever the specification that the foundry adopts, it should be strictly adhered to until such a time as the foundry has found a specification better suited for its work.

In this connection, it might be well to consider what is meant by specification or chemical analysis. For example, the chemical specification in Table I may be taken. Table II gives the formula that is covered by the chemical specification in Table I. Like any specification, there is a slight flexibility, and the minimum amount of linseed oil that the specification will allow is shown in Table III. This is true only in case the linseed oil used has an iodine number considerably over 182.

All raw linseed oil to-day is sold by the crushers on A.S.T.M. specifications, which require a minimum iodine number of 178, but usually commercial raw linseed oil has an iodine number of 180 or over.

Substitutes for Linseed Oil.

It is possible that any drying or semi-drying oil, with the exception of fish oil (fish oil is eliminated in the specification by the Griffin test), can be used to replace linseed oil, providing the iodine number is 180 or over. The only one of the commonly-known drying oils with a higher iodine number than linseed oil is perilla oil, which ordinarily has an iodine number of 200 to 204.

Perilla oil, as a general rule, sells at considerably over the market price of linseed oil. Also, even though mixed with cheaper oils—such as soya bean, corn, etc.—this will not produce such a reduction in cost as would warrant its being substituted in place of raw linseed. However, should it be substituted, no harm would be created so long as the combination of drying oils would retain an iodine number over 180.

From comparative tensile-strength curves of the different core-oil mixtures shown in Tables II, IV, V and VI, all meeting the chemical specifications in Table I, it is quite evident that, if the specification is kept constant, not only the tensile strength but the drying time remains the same. Certainly any one of these oils could be used interchangeably without trouble in the core room.

The iodine number of drying or semi-drying oils is considered a measure of oxidation, and it has been proved that this holds true in core oil. Table VII shows the iodine and saponification numbers of the drying and semi-drying oils used. As stated previously, the iodine number varies considerably with the different oils, but the saponification number is practically the same. Therefore, it is much more important to specify iodine than saponification, but both, of course, are required to make a solid specification.

TABLE IV.—*Core-Oil Mixture—Perilla and Corn Oils.*

Perilla oil, per cent.	35
Corn oil, per cent.	15
Rosin (H grade or better), per cent. ..	25
Kerosene (water white), per cent. ..	25

TABLE V.—*Core-Oil Mixture—Perilla and Soya-Bean Oils.*

Perilla oil, per cent.	35
Soya-bean oil, per cent.	15
Rosin (H grade or better), per cent. ..	25
Kerosene (water white), per cent. ..	25

TABLE VI.—*Core-Oil Mixture—Perilla, Soya-Bean and Corn Oils.*

Perilla oil, per cent.	35
Soya-bean oil, per cent.	7½
Corn oil, per cent.	7½
Rosin (H grade or better), per cent. ..	25
Kerosene (water white), per cent. ..	25

Rosin.

So far, only the drying oils have been considered. The second important ingredient is rosin. Table VII shows the iodine and acid numbers, which are two very important factors. However, there is also a third factor to be considered—colour. Under the specification in Table I, colour is designated as light, clear amber through a half-inch section. In order to obtain this colour it is necessary to use H grade or better. If light-colour rosin is used, the iodine and acid numbers will meet the requirements of the specification in that all rosin having a colour of H or better will have about the same chemical analysis.

TABLE VII.—*Iodine and Saponification Numbers of Different Core Oils.*

	Iodine No.		Saponification No.
Perilla oil	200.82		191.2
Linseed oil (raw) ..	182.56		188.94
Soya-bean oil ..	131.4		191.18
Corn oil	130.7		189.86
Rosin	187.65	Acid No.	160.34

The third ingredient used in Table II is designated as water-white kerosene, which is clear and white in colour and free from offensive odour. It is controlled in the specification by the flash, fire and gravity, all of which are interlocking; and unless a good grade of material is used, it is impossible to meet all of the above factors. Water-white kerosene will steam distil out of the green-sand core with the water during the baking without producing offensive gases in the core room and leaving no heavy mineral-oil ends behind to interfere with the binding film produced by the drying oil and rosin.

Conclusions.

Although the iodine number has been stressed more than any of the other factors given in the specification, they all, however, are interlocking and individually carry the same importance. Each item must be adhered to strictly or the value of the specification as a whole will be destroyed.

In all of the author's years of chemical experience in organic analysis and compounds, he has always found that when the chemical analysis was identical, the physical properties produced also were identical. The author is positive that if this is not true, there is a variable factor not controlled by the specification, and the specification should be changed so as to control this factor positively. It is hoped that enough interest can be created among foundrymen concerning chemical analysis of core oils so that a standard method of analysis can be adopted.

E

* Extracted from a Paper read before the Cleveland Convention of the American Foundrymen's Association.

† "The Qualities of Commercial Core Oils." Trans. A.F.A., vol. 33, p. 73.

‡ "Core-Oil Specifications." Trans. A.F.A., vol. 35, p. 148.

§ "Uniformity of Core Oil." Trans. A.F.A., vol. 37, p. 526.

Semi-Steel Castings.

By "Vallishe."

During the past few years the practice of adding steel in various forms to cast iron in the cupola has gained rapid favour. One often sees the resultant metal, now known as semi-steel, specified in many engineering contracts. In fact, it is now displacing cast steel in numerous cases, being much lower in cost and comparing most favourably in some of its physical properties.

In to-day's markets cast iron has many more rivals than it had fifteen or more years back. Rolled steel, cast steel, reinforced concrete and other materials have all made rapid strides since the war, capturing markets which at one time belonged almost entirely to cast iron. The cast-iron column trade has now almost collapsed, steel stanchions being used on at least 90 per cent. of constructional jobs. Cast-iron tanks are faced with severe competition from the steel and reinforced-concrete people. Generally, it has been said that between 20 and 30 per cent. of the goods at one time made of cast iron are now lost to other markets outlined above. Some of this trade must be regained, and in semi-steel we have a great factor to success.

Physical and Chemical Properties of Semi-Steel.

The physical properties of a good semi-steel are, without doubt, far in advance of ordinary grey iron. For wear and heat resistance (or "heat-wear") the life of a semi-steel casting is greater than one of cast iron, the design being common to both. In Table I is given a list of various types of castings made in both semi-steel and ordinary cast iron, the life of each being shown. This state has been drawn up from actual results and experiments, and is in no way theoretical. Each casting has been tried under exactly similar conditions, no favour having been shown either way. It should be mentioned, however, that the cast iron was one of quite a high grade and in some of the castings contained a fair percentage of hematite.

Table I.

Description.	Length of service.		Nature of work.
	Cast iron.	Semi-steel.	
Hoops.. ..	20 months	29 months	Grinding mill.
Firebars ..	11 months	14 months	Lancashire boiler.
Worm wheel ..	5 years	7 years	Revolving kier.
False bottom	15 months	18 months	Crusher.
Furnace cheeks	3 years	4½ years*	Gasworks retort.
Sprocket wheel	2½ years	3 years	Paper machine.

* This test is not complete as the castings in semi-steel are still giving good service.

Having considered the physical properties of cast iron as compared with semi-steel, a brief survey of their analyses will be interesting. Table II gives the analysis of a cast-iron and a semi-steel mixture, selected at random. It will be noticed that the carbon content is considerably higher in the cast iron than in the semi-steel. Manganese shows a lower percentage in the former than the latter mixture. This alone tells its own story, if one will study the effects of graphite, carbon and manganese on cast iron.

Table II.

Material.	C.	Gr.	Si.	Mn.	P.
Cast iron ..	3.526	2.61	1.63	0.52	0.79
Semi-steel ..	2.475	1.907	1.72	0.67	0.61

Although the table given cannot be guaranteed as to its strict accuracy, it gives one a fair comparison of the two mixtures. Maybe the cast iron was not of an exceptional high grade, but, on the other hand, improvements can be made in the semi-steel mixing.

Some time ago the writer came across the records of a series of tests made with both cast iron and semi-steel. Each test-bar had been made at the same foundry, and the test covered several weeks. Four test-bars of each iron were taken. The average breaking stress was as follows:—Cast iron, 11.5 tons per sq. in.; semi-steel, 14.6 tons per sq. in. Quite a considerable increase in strength, and a very strong point when endeavouring to secure a certain valued order. Solid facts and performance convince the customer far more than theoretical figures.

Cost of Semi-Steel.

Some foundrymen imagine that a semi-steel mixture is more expensive than the ordinary grey-iron mixture. This belief is quite prevalent even out of the trade. A semi-steel mixture can be made quite as cheap, if not cheaper, than a good grey iron. The percentage of steel and scrap used is, of course, the governing factor in the cost. Some foundrymen are using at least 30 to 35 per cent. of steel scrap (composed of run-down joist ends, wrought-iron scrap, steel files and horse-shoes). The writer is assured that a good semi-steel mixture can be made at even less than the cost of grey iron. Actual experiments and figures have shown this.

Semi-Steel as a Selling Factor.

There is little doubt that a large percentage of customers favour semi-steel as against cast iron for many requirements. In fact, the writer has found it possible to secure orders for semi-steel castings, which would otherwise have been lost if cast iron had been offered. It has a distinct appeal to the average man. It is something comparatively new and its performance impresses him. Without doubt it is a great asset to the jobbing foundry in particular. In many instances it is competing with cast steel, and, although it cannot claim the same physical properties, it is by far the cheaper. The writer has from time to time kept authentic records of comparisons between semi-steel and cast steel, both in performance and cost, and a few of these figures are given in Table III. Such records are very useful, and, indeed, valuable, when trying to persuade a client to give one an order, especially when he has previously had the particular goods made in cast steel.

Table III.

Type of casting.	Life in semi-steel.	Semi-steel. cost.	Life in cast steel.	Cast steel. cost.
	Years.	£ s. d.	Years.	£ s. d.
Crusher hoops ..	2½	15 0 0	4	40 0 0
Worm wheel	7	3 0 0	8	5 10 0
Retort frame	9	16 0 0	12	27 10 0
Sprocket wheel ..	3	2 0 0	5	3 10 0

In conclusion, it may be said that, although one cannot expect semi-steel to win back anything like a large percentage of the lost trade, it can at least help to combat further competition and obtain orders which would at one time have been lost. If it only brings a 10 per cent. increase of orders to the iron foundry, surely it is well worth persevering.

Reports and Dividends.

United Flexible Metallic Tubing Company, Limited.—Ordinary dividend of 2½ per cent., less tax.

Mansfield Engineering Company, Limited.—Profit for the year of £1,249, which has been transferred to credit of profit and loss account.

Hurst Nelson & Company.—Final dividend of 12½ per cent. and a bonus of 2½ per cent., making a total distribution on the ordinary shares of 20 per cent. for the year to July 19 last.

Puzzle: Find the Scrap.

By "Onlooker."

The scarcity of scrap metals, to which reference has been made in these columns from time to time, continues, and is certainly more apparent than it was a couple of months ago. Not unnaturally, prices are ruling relatively high, and a start has been made in returning to the use of virgin metals again. Consumers of scrap may be divided into two classes—those who use old metals regularly and practically never buy anything else, and those whose preference is for virgin material but have been driven by inflated values to seek for cheaper substitutes.

During the ramp in copper in the spring of 1929, many foundries and not a few refineries began to use scrap freely, and the practice was continued right up to the final break in price last April, the first quarter of this year seeing a last clear-up of all old metal available. Manufacturers have, of course, been doing the same thing, and as a result brass is every bit as scarce as copper. Other influences are, of course, at work, one of the most important being a slowing down of the manufacturing system, which means less old material being made available for consumption. Replacements of existing units, too, are being held up in all directions, and the sum total of all these adverse factors from the consumers' point of view is now seen in a very definite scarcity of scrap.

Some suggestion of a rise in the price of copper will doubtless release reserves at present held up by dealers and others holding on for a better realisation value, but of that there is not at present any indication, and the chances are that when it does come the greedy fellows will do no better, if as well, as they would to-day, for scrap prices are at present unduly inflated, and pressure to sell would undoubtedly have the effect of widening the differential between old and new metals. What will happen if the quotation for copper weakens still further it is hard to say, but the chances are that very little alteration in old-metal prices would be seen, more especially as the standard market is showing a very firm front.

In America business in scrap materials has slowed down to a most remarkable extent, and except at "fancy" prices purchases are almost impossible. The fact is that as far as brass is concerned collection by the "road men" does not pay at ruling values, for what the "junk" dealers are willing to offer—it must be remembered that ordinary collected material requires sorting—does not cover the daily outlay incurred in scouring the countryside for stuff. Consumers who receive their scrap graded in accordance with the specifications of the National Union of Waste Manufacturers, which controls such matters in the States, are apt to forget that a lot of hard work and expense have gone to prepare the material. Apart from machine magnetting to remove free iron, old metal has to be hand-sorted and wages must be paid.

Just as the market quotations for tin, copper and spelter have fallen practically to the cost production level, so has the quotation for scrap. This is a point which cannot be stressed too much, for many people are apt to think that secondary metals, since they do not incur a mining charge, require nothing in addition to the prime cost in order to show a profit and keep a steady tonnage available for consumption. Some classes of scrap are, of course, ready for the foundry without receiving any attention, but by far the greatest part of "old junk" has to receive expert treatment before it can be offered for sale without grave risk of serious complaints from customers and rejection.

No deliberate curtailment of scrap production has taken place and artificial restriction of output is unknown, but the swing of the pendulum has gone so far that old metals are compelled to lie "doggo" until better times come.

The Manufacture of Cast Iron in the Electric Furnace.

By Walter Lister.

It is well known that one of the main causes of failure of cast-iron ingot moulds is the "growth" of the iron during the course of successive heatings. This "growth," sooner or later, results in a crack developing in one or more sides of the mould, while otherwise the mould may be still fit for further service. This applies more especially to moulds of large capacity.

According to some authorities, the cause of the growth is an increase of the cubical contents of the iron due to oxidation of the carbon and silicon which it contains. Fracture is encouraged by an excess of graphitic carbon, which, existing in large flakes, is a source of weakness. Cast iron low in total-carbon content shows much less liability to growth than very grey iron high in carbon and silicon, and consequently rich in graphite.

An attempt to lower the total-carbon content is often made, when cupola melting, by adding steel scrap to the charge; but the required result is usually negatived by the necessity for increasing the coke consumption in order to provide fuel for the loss involved through the carburisation of the steel scrap. Moreover, a higher coke consumption usually results in an increase of sulphur content of the iron, which also is detrimental to the life of ingot moulds.

At the particular works with which the writer is connected, the iron for moulds over 3 tons capacity and up to 60 tons is invariably made in the basic electric furnace. It has been found that the electric iron gives much better results than the ordinary cupola iron. A greater control can be exercised over the analysis and melting conditions. The temperature of the metal can be raised to any desired extent, and the sulphur (and possibly the oxygen) content reduced to very low limits.

The high temperature is beneficial, inasmuch as it tends to throw all the carbon into solution and retard the formation of large flakes of graphite, the latter being found in the casting very finely divided and evenly distributed. Another beneficial result of the high temperature is that it produces a uniform structure in the iron itself which can be noticed in its improved machining and wearing qualities.

The Process.

From practical experience, it has been found that the best method is to use 50 per cent. pig-iron and 50 per cent. steel scrap in the charge. A layer of scrap is first charged on the bottom and then a layer of finely-ground anthracite coal. Scrap and coal are then charged alternately until the whole of the scrap is incorporated. The current is then turned on until the whole of the scrap is melted. A feed of lime is then thrown in to form the slag. When this is melted, pig-iron is then charged in two or three portions, until the whole charge is complete. Each addition of pig should be allowed to melt in the molten scrap before the next addition is made. When the whole is completely melted, it should be well rabbled and a sample taken for analysis. The sample should be cast in a sand mould and not into a chill mould. A set of half-a-dozen moulds can be prepared in sand in a conveniently-sized box, the moulds being each about 5 in. by 1 in. by 1 in. The samples should be allowed to cool in the mould and not quenched in water under any consideration, as this will give a misleading idea of the physical condition. One-half of the broken sample should be analysed for total carbon, silicon and manganese. When the result is known, additions of ferro-silicon, ferro-manganese and carbon can be made to the bath as required. If only a small amount of carbon is required, it can be added in the form of high-carbon pig, but if, say, about 0.40 to 0.50 per cent. is still required, the slag should be raked off and coal dust thrown on to the bare bath. When sufficient carbon has been absorbed (which may take about 20 minutes), more lime should be put on to make a fresh slag, and the charge raised to the required temperature for tapping, which should be in the neighbourhood of 1,400 deg. C.

For a 10-ton charge, about 4 cwts. of coal should be put in with the charge and about 4 cwts. of lime to make the slag. Melting should take place at full load on high voltage, but afterwards the current should be turned on to low voltage, using about 3,000 amps. per phase. For larger ingot moulds, of course, larger furnaces are used, or two or three even, tapping into one large ladle. The whole operation, from commencing to charge to tapping, takes about 4 hrs., and the current consumption is about 450 kw.-hrs. per ton.

Iron for General Castings.

For this class of work also, iron made by the method just described will be found much superior to the ordinary cupola product. When the ultimate cost is assessed, owing to the improved quality of the electric iron and fewer rejections, it will be found to compare very favourably with the cost of castings made direct from cupola iron; in fact, there may be a distinct saving.

The usual method of procedure in this case is to have a furnace full of iron ready for, say, 7.30 a.m. in the morning, when the moulders arrive. Any quantity can be tapped from the furnace as required, but after each tap, further additions of pig or cast iron or steel scrap should be made and the analysis adjusted accordingly. The atmosphere should be kept reducing and the slag just faintly "carbide" by an occasional shovelful of powdered coal. At intervals during the day most of the slag should be poured off and a fresh one made by further additions of lime. At the end of the day, if the shop is not casting during the night, it should be so arranged that the last tap will empty the furnace completely, so that it can be dried up and fettled.

The Duplex Method.

This is a method which has been considerably developed recently for the manufacture of high-class castings for the motor industry. Either acid or basic electric furnaces can be used. The process consists in transferring molten iron from the cupola to the electric furnace, and there superheating and refining it and adjusting the analysis to any desired specification.

The most practical and convenient method is to have a cupola and an electric furnace installed side by side. A runner or spout extends from the cupola and connects with another runner, which allows the iron to run into the electric furnace through one of the doors. The cupola should be charged with a little less coke per ton than would be used in the ordinary way of direct casting. As soon as the cupola is fully charged, the blast is put on and in about 10 minutes the first iron appears. This runs directly into the electric furnace. When the furnace is full, the current is switched on and the operation of super-heating and adjustment of analysis commences. The adjustment of analysis in this case consists of adding the necessary amounts of steel scrap, ferro-silicon and ferro-manganese, after an analysis of the bath has been taken. The cupola charge should be so regulated that the crude iron is higher in carbon and lower in silicon and manganese than is desired in the finished product.

The operation should be continuous throughout the day. In less than two hours after the blast is turned in to the cupola, the charge in the electric furnace should be ready for tapping. The ladles should be first heated by inverting them over a bright coke fire half an hour or so before use.

While the iron is being refined and adjusted in the electric furnace, the cupola is again charged, so that when the furnace is empty another charge is ready to be run in. At the end of the day's run the cupola is emptied and the bottom dropped. The electric furnace hearth is also fettled with sand or dolomite, according to whether is is acid or basic.

The acid process, of course, will not eliminate sulphur, so that the cupola iron must be within safe limits in this respect, but when using a basic-lined furnace, the full advantages of sulphur removal, in addition to other benefits, is obtained. This makes possible the use of an inferior class of pig, as a sulphur content of 0.10 to 0.12 per cent. can easily be reduced to 0.03 per cent. and less, under a basic reducing slag and sufficient heat. There is no elimination of phosphorus in the acid and but little in the basic process, so that this element is only affected by the amount of dilution with low-phosphorus steel scrap that might take place. This also is the only way in which sulphur might be reduced in the acid process.

Power Consumption.

In this process, of course, the power consumption is much lower than when melting all cold material. For an output of 6 or 7 tons per hour, it would average about 100 kw.-hr. per ton.

Comparative Analyses.

Table I shows the analyses of cupola-melted irons before and after treatment in the electric furnace, whilst in Table II the relative mechanical tests are set out. Table III outlines the comparative costs of the two products.

TABLE I.—*Analyses of Cupola-Melted Irons before and after Treatment in the Electric Furnace.*

		C	Si	Mn	S	P
1.	Before	3.48	1.42	0.56	0.09	0.10
	After	2.98	1.65	0.66	0.02	0.08
2.	Before	3.50	1.79	0.54	0.09	0.12
	After	2.56	1.88	0.84	0.02	0.09
3.	Before	3.45	1.63	0.44	0.10	0.125
	After	2.49	1.83	0.55	0.03	0.11

TABLE II.—*Comparative Tests of Electric and Cupola-Melted Cast Iron.*

	Electric.	Cupola.
Transverse strength (lbs.) ..	4,740	2,950
Deflection in in.	0.135	0.10
Tensile (tons per sq. in.).. ..	27.9	19.7
Elongation per cent. in 2 in. ..	1.10*	0.75*

* We attach little importance to these figures owing to practical difficulties of measurement.—EDITOR.

From Table III it will be seen that, although the initial cost of electric cast iron is, in this case, slightly higher than that of cupola iron, obviously, the charge may be made up from varying percentages of different grades of scrap in order to give the most economical charge for melting. Steel scrap has the advantage that it is usually low in sulphur and phosphorus. In the cupola, the higher coke ratios necessary with increased percentages of steel scrap result in increased sulphur pick-up, as is similarly the case with increased proportions of cast-iron scrap, and necessarily limit the amounts of these materials used. Moreover, the cupola cannot properly super-heat iron to the temperature necessary for many classes of work, such as piston rings, valves and similar small castings. The electric furnace has the advantage here, in that

(*Continued on page* 167.)

The Continuous Process as Applied to Malleable Practice.*

By B. R. Mayne.

The trend of modern industry is to produce a better product at a lower cost. In the past, malleable foundries did not give a great deal of thought to conveyor equipment, although by its use many grey-iron plants were reducing their moulding costs considerably.

In the author's foundry about 200 tons of iron were being melted daily in four oil-fired air furnaces. This melting equipment did not seem feasible for continuous melting, and it was deemed necessary, therefore, to look for a process that would give a continuous supply of hot iron and would also be flexible, so that production could be varied up to 40 tons per hour. A steady supply of good metal is essential to the success of continuous moulding operation. Various processes were considered before deciding on one that would result in a satisfactory iron at a cost comparable with that of the air furnace, or, more essential, one that would produce iron in the ladle at a lower cost per ton than the air-furnace process. Numerous processes could be used to produce a satisfactory iron, but when all items were considered—such as supply of raw material, flexibility of operation, cost of metal at the spout, quality of iron and other factors—the cupola-electric process, or, as it is commonly referred to, the "duplex process for making malleable iron," was chosen.

Before making extensive changes in the plant, a series of tests were conducted at the research laboratories of the General Motor Corporation, to ascertain the practicability of this process, which had previously been tried out in Europe, and where it failed to produce a commercial malleable iron. From the beginning, the tests proved that the process had possibilities, and within a few weeks a good commercial malleable iron was being produced. With the preliminary work completed, the next step was to lay out the process on a commercial basis to fit into the building already constructed at the plant. Part of the old foundry was used for the mould conveyors and a new building was constructed for the melting department, which housed the cupolas, electric furnaces, transformers and generators.

Cupola-Melting Equipment.

The melting equipment consists of three 90-in. shell cupolas; three 10-ton, oval-shaped, electrically-tilted forehearths; one 3-ton electric crane to transport the cupola metal to the electric furnaces, and two 3-ton electric furnaces. Two rotary-type blowers furnish the blast for the cupolas. A 10-ton electric crane unloads all the raw materials for melting and places them in the proper storage bins. The storage space for the various pig-irons and scrap is very limited, which makes it necessary to keep a close check on the raw materials received. The inventory is kept low, with only two or three days' run in the yard at any one time.

The cupolas are lined down to 66 in. and have a melting capacity of 20 tons each per hour. Two of the three cupolas are used daily during normal operation; the third cupola is repaired during the day, and one used during the day is repaired at night. A complete repair in the melting zone is required at the end of each day's run. The slag conveyor is at the rear of the cupolas. The molten slag drops from the slag spout into a trough of water, a moving chain in this trough collects the slag at one end of the system, and it is from this point that the slag is hauled away. This arrangement simplifies the handling of the slag and makes conditions more pleasant for the cupola men. Each of the three forehearths holds 10 tons of molten iron, and they are lined with a 9-in. wall.

Electric-Furnace Capacity.

The two electric furnaces are rated at a 3-ton cold-melt capacity, but they hold from 10 to 12 tons of molten metal. Each furnace has a 1,500-kilovolt-ampere 3-phase transformer which steps the voltage down from 5,100 to 115 volts. A "Limuter" was recently installed on one of the furnaces, and it has been found quite successful in keeping down the demand. By close supervision it has been possible to hold the power peak down to the desired point. This has had the effect of holding down the kilowatt-hour consumption, which varies somewhat according to the tonnage.

When operating the furnaces near capacity, the kilowatt-hour consumption per ton of hot metal tapped, which includes about 5 per cent. cold-steel scrap, runs from 92 to 98. When operating at reduced capacity, the power consumption will run as high as 120 kilowatt-hours per ton.

Refractories for Electric Furnaces.

From 5 lbs. to 6 lbs. of graphite electrodes are used per ton of hot metal. Scrap electrodes are used for burning-in of holes in the bottom, which is rarely done. Silica brick is used for refractories on the electric furnaces.

The life of the roof is from four to seven weeks, during which time 2,500 to 5,000 tons of molten iron are poured from the furnace. The life of a side-wall is longer in most cases than is the life of the roof. The bottom is made up of two layers of clay brick, on top of which are fused layers of ganister running about 8 in. thick. Proper operation of the furnace is the greatest factor in increasing the life of refractories. The furnace is operated free from slag at all times. To keep the slag off the hot iron, the furnace operator tilts the furnace backward and uses a green pole to remove floating slag from the metal. A maximum of 425 tons of metal has been poured in 10 hours. The floor space of the present conveyor system is half of what was formerly used for floor moulding, with more than double the former production.

Material Used.

Since starting the production of cupola-electric, a variation of material has been used. At present two grades of pig-iron, alloy-free flashings, pressed-steel bundles and rails, besides the hard-iron remelt and soft-iron scrap, have been standardised.

This material is placed in bins, either on the ground or charging floor, by means of the 10-ton crane. The charge is loaded on steel trucks by the charging hands. These trucks are pushed on to a dial scale, where the charge is carefully weighed, and then are moved to the cupola charging floor, where the material is manually charged. Three of these dial scales are used for weighing the metal charge, and one for the coke charge. The scales are checked hourly by the weigher and all discrepancies immediately corrected.

Charging Practice.

Considerable thought has been given to automatic charging, but so far only preliminary work has been done. The nature of the charge differs from that used in most foundries where a large percentage of pig-iron is used. The charge consists of 10 to 12 per cent. pig-iron, 38 or 40 per cent. steel scrap and 50 per cent. hard-iron sprue. Most of the steel in the charge is made up of flashings, which are very bulky and do not lend themselves to automatic charging as readily as would appear. The coke arrives at the plant in drop-bottom cars, which are unloaded by a skip hoist into a storage bin holding about two and one-half cars of coke. At the bottom of this storage bin are three hoppers, from which the coke is loaded into the coke buggies, weighed and charged into the cupolas.

The bed takes about 4,000 lbs. of coke, with 320 to 360 lbs. between the 4,000 lbs. of metal charged. Limestone is supplied to the charge floor by means of the 10-ton crane. A trip bucket is filled with limestone on the ground, raised to the charge floor and shovelled on to the pile used to supply the cupola.

The molten cupola iron flows into the forehearth. Soda ash, which is used to desulphurise the metal, is placed in the spout, melted and washed into the forehearth. The soda-ash slag is allowed to remain on the metal from 1 to 1½ hours before being skimmed off. Approximately 20 per cent. of the sulphur is removed by using about 6 lbs. of soda ash per ton of iron treated. The operation of the cupola is very similar to that in grey-iron practice, but the blast pressure is somewhat lower, due to the open charge, and averages about 8 ozs. while melting 16 tons per hour. The maximum blast does not exceed 13 ozs. at any time.

Metal Control.

The temperature of the iron at the cupola spout averages 1,540 deg. C. During the time the metal is in the forehearth before being taken to the electric furnace, the temperature drops 55 deg. C. during normal operation. The cupola metal is transferred by means of a 3-ton crane from the forehearth to the electric furnace along a monorail. The furnaces are filled with molten iron in the morning. When pouring is started, three tons of hot iron at about 1,620 deg. C. are taken out of one furnace, leaving about seven tons in the furnace. Three tons of clean cupola metal are added to this furnace and the other is tapped while the furnace receiving the cold metal is getting hot, which takes about four minutes. Three tons of iron from each furnace are poured alternately in this manner until the end of the day, when the furnaces are emptied. By this arrangement a continuous supply of uniform iron is given to the foundry throughout the day.

The duplex process for making malleable iron requires very close laboratory control of all raw materials and molten iron. This is true of every metallurgical process, but in air-furnace melting formerly carried out in the plant—and which is the practice in other plants—preliminary samples were taken for chemical analysis of the molten iron before being poured into moulds. If the analysis was not as desired, the necessary additions could be made before tapping.

A practice is made of taking samples for analysis from the cupola iron every 20 min. throughout the day. The iron being analysed is poured into moulds before the analysis is completed, and the routine analysis therefore serves only as a guide. The analysis when reported represents iron that was charged in the cupola about one hour and forty-five minutes before. It takes about an hour for the charge to descend in the cupola, 10 minutes in the forehearth and 35 minutes for a complete chemical analysis. Chemical analyses covering carbon, silicon, manganese, sulphur and occasionally phosphorus are made on six samples of iron taken daily from each electric furnace.

Coke Requirements.

The analysis of the raw material covers coke, pig-iron and the various steels used. From the standpoint of uniformity of cupola operation, quality of the coke is the most important. The most reliable routine test for coke is the combustibility test. A fast-burning coke is desired, as one can melt faster and thereby use less coke.

* Extracted from a Paper presented at the Cleveland Convention of the American Foundrymen's Association.

A coke with a temperature rise of 140 deg. C. in two minutes requires about 300 lbs. of coke per 2-ton charge, while a coke with a temperature rise of 140 deg. C. in four minutes requires about 400 lbs. of coke per charge. From the standpoint of quality of iron produced, both cokes will give equally as good metal.

The purpose of the coke testing is to try to get the producer to supply a uniform coke. It can readily be appreciated that uniform cupola operation cannot be expected with a coke showing a variation of two minutes for a 140 deg. C. temperature rise. It is the practice to change the amount of coke used in the charge to conform with the carbon content of the iron which it is intended to pour at the spout of the cupola. On all coke tests, the total temperature rise and ignition point are carefully noted and studied. The combustibility test used for coke is that described by A. L. Boegehold in an appendix to his Paper* presented at the 1929 meeting of the American Foundrymen's Association.

The control of the pig-iron starts with the study of the iron ore used at the blast furnace. A metallurgist is at the blast furnace during the time the pig-iron is cast, in order to get all the information necessary for a study of the quality of pig-iron produced. The various casts of iron are followed through the melting and annealing processes.

Variation in operation of the blast furnace and composition of the burden has been found to bear an important part in production of sound castings which will readily anneal. The machinability of the annealed casting is also dependent to a more or less extent upon the blast-furnace practice and quality of pig-iron used. When the pig-iron arrives at the plant, a chemical analysis is made of three pigs from each truck, to check the blast-furnace results. It was formerly necessary to take the analysis of at least ten pigs from each truck, but the blast-furnace people now have taken steps to produce a more uniform pig-iron by pouring casts from an 80-ton ladle.

In the duplex process various grades of steel are used. The largest percentage used in the charge is flashings produced at various drop-forge plants. Alloy-free flashings are specified, but it is necessary to keep a close check on this material as it arrives at the plant, because very often some alloy flashing is mixed with the plain carbon flashing. This is the only precaution taken on the steel. Rails, sheet bundles, angle bars, boiler plates, etc., do not contain any alloys and the only cause for their rejection is in the case of excessive rusting.

Foundry Process.

The sand is first prepared for use by means of a magnetic separator, screen, tempering belt and paddle mixer, and it is finally tempered and aerated for delivery to the hoppers over the moulding machines. An operator stationed on an elevated platform regulates the water from that point to hold the moisture in the sand to within 0.1 per cent. He is paid a bonus to hold the moisture content at a fixed percentage. Delivery of the prepared sand from overhead hoppers to the flasks is effected by means of a conveniently-placed lever. There is a total of 112 moulding stations and each station is located alongside one of the moulding conveyors, thus enabling the moulder to place his completed moulds on the conveyor by taking only a few steps.

The moulds travel on the conveyor to a pouring zone, where the pourers stand on a moving platform and pour them off continuously by means of ladles carried by electric hoists operating on an overhead monorail loop. The pourers' platform moves at the same travel speed as the moulds.

* Boegehold, A. L., "Quality of Iron as Affected by Blast-Furnace Practice." Transactions A.F.A., vol. 37 (1929), Appendix, pp. 148-152.

Complete Conveyor System.

The moulds are cooled on the return path of the mould conveyor, and at the end they are dumped on to a vibrating shake-out screen. The sand discharges through the screen, while the castings free from sand are discharged into baskets which have perforated plate sides to hasten the cooling of the castings. These baskets are carried by means of a trolley conveyor to the outside of the building for cooling. Then they go to the cleaning room, where they are dumped. From this point the empty baskets are returned to the various shake-outs for reloading.

Annealing.

Leaving the cleaning department, the castings arrive on a belt conveyor in the annealing room. The annealing process has been continuous for years. Three oil-fired kilns of the pusher-car type anneal all the castings. The two larger kilns are each 347 ft. long and are regularly operated on a 96-hour annealing cycle, but have produced consistently good iron on a 90-hour cycle, which is equivalent to 65 tons of castings daily from each kiln. The other kiln, 180 ft. long, has operated for months on an 80-hour cycle and occasionally on a 72-hour cycle.

The matter of continuous melting, moulding, pouring and annealing is of particular interest to the malleable industry of to-day. Production and cost records prove that the money invested in the continuous-process equipment has been fully justified. Further strides along these lines will present themselves as time goes on, and the malleable industry should be ever alert to make use of any equipment which tends to give a better product at a lower cost.

The Manufacture of Cast Iron in the Electric Furnace.

(*Concluded from page* 165.)

it is able to produce strong low-phosphorus grey iron of the necessary fluidity for small and intricate sections without resorting to the embrittling and weakening effect of high phosphorus.

Solidity or closeness of grain, greater strength, uniformity, freedom from hard spots and blowholes and undesirable slag inclusions, better machinability and performance, is so characteristic of electrically-made cast iron that it is worthy of the attention of all ironfounders who have to meet the stringent specifications of present-day requirements.

TABLE III.—*Comparative Costs of Electric and Cupola-Melted Cast Iron (Cold Melting).*

	£	s.	d.
10 cwt. steel turnings, at 37s. 6d. per ton ..	0	18	9
5 cwt. foundry scrap, at 58s. 6d. per ton ..	0	14	7½
5 cwt. cast-iron scrap, at 58s. 6d.	0	14	7½
5 per cent. melting loss	0	2	9
500 kw.-hrs., at 0.624d.	1	6	0
Furnace labour	0	4	3
10 lbs. carbon electrode, at 3½d. per lb. ..	0	2	11
Refractory costs and depreciation	0	2	8
Ferro-alloys and slag additions, coal ..	0	4	1½
Total per ton	4	10	8½
10 cwt. low phosphor and sulphur pig, at 77s. 6d. per ton	1	18	9
5 cwt. foundry scrap, at 58s. 6d. per ton ..	0	14	7½
5 cwt. cast-iron scrap, at 58s. 6d.	0	14	7½
6 per cent. melting loss	0	4	5½
1½ cwt. foundry coke, at 20s. per ton ..	0	1	6
Furnace labour, fluxes, refractories, blast, etc.	0	13	7
Total per ton	4	7	6½

[The author's figures as set out in Table III require a certain amount of interpretation. Primarily, it should be assumed that a 10-ton electric melting unit is being operated, and, with smaller units, the following items must be increased: —Current consumption, furnace labour, electrode and refractory costs. But should the cost of producing a 28-ton per sq. in. material be compared with, say, a 15- to 17-ton product?—EDITOR.]

Catalogues Received.

Bushes.—A leaflet received from Messrs. Crofts (Engineers), Limited, Thornbury, Bradford, describes a real novelty in fabrication of bushings. It carries the trade name of "No-Lub" and is designed to eliminate lubrication. The bushes are non-metallic and are oil-impregnated, so that no further lubrication is ever necessary. They will carry loads up to 100 lbs. per sq. in. at temperatures up to 100 deg. Fah.

Rust Preventive.—Messrs. Atlas Preservative Company, Limited, Deptford, London, S.E.8, have prepared a 16-page booklet which brings home to the engineer the necessity of protecting ironwork from rusting and stresses, with arithmetical examples, the economy realisable by avoiding non-durable paints and using instead material of the highest quality. A cleverly-selected group of illustrations, including one of Ley's foundry extensions, shows the range of work undertaken by this concern. The brochure certainly carries a worth-while message.

Book Review.

English-German-Italian Technical Dictionary. Published by Hubert Hermanns, 61A, West Dahlemer Strasse, Berlin-Lichterfeld. Price 15s.

This pocket dictionary will be particularly useful to foundrymen, as the author is a well-known contributor to the literature of the castings industry. Moreover, he has had the advantage of the collaboration of Capt. Delport, who, too, possesses special qualifications in this direction. The scheme followed has been to divide into three sections—German, English and Italian—and then to translate each word or phrase into the two other languages. The location of the three sections is facilitated by thumb-cuts. By utilising very thin paper 400 odd pages are got into half an inch, which renders it suitable for the pocket when making works visits abroad.

Publications Received.

Spectrum Analyses. Bulletin No. 2. Published by Adam Hilger, Limited, 24, Rochester Place, Camden Town, London, N.W.1.

This bulletin has real interest for the light-alloy manufacturers, as indications are given of important work in connection with *quantitative* metallurgical analyses of a number of alloys and metals which they regularly handle.

Report of the British Acetylene Association, to the 10th International Acetylene Congress, on the "Progress of Oxy-Acetylene Welding and Cutting in the British Empire." Price 7s. 6d. Published by the Association from their offices at 12, Russell Square, London, W.C.1.

We congratulate the Association and the compiler (Mr. A. B. Harrower) in having placed before the world a really intelligent survey of the applications of acetylene in industry, and the steps taken throughout the Empire for training the future personnel for welding.

The report is divided into three main sections:—(1) Technical Learning, (2) Applications in Industry and (3) Plant Equipment and Materials. It is obviously section 2 which will interest our readers, as it outlines the progress achieved in practically every industry, including their own. Actually, three pages are devoted to iron, steel and brass founders, and no fairer review could have been written. We strongly recommend our readers to purchase and study this book with the object of evaluating the nature, strength and potentialities of welding in general, and the acetylene process in particular, as a competitor against the utilisation of castings.

The Economic Utilisation of British Pig-Iron Resources.

(*Continued from page 152.*)

District "L"—South Staffordshire—*continued.*

Index No.	Firm or Works.	Type.	Designation, Grade or Brand.		COMPOSITION. C. Combd.	C. Gr.	C. Total.	Si.	S.	P.	Mn.	Other Constituents.	Remarks.
76	BRADLEY & FOSTER LTD., DARLASTON—*continued.*	H	CAPPONFIELD "H.B." Silky	A	—	—	3·2	4·0—5·0	0·02	0·30	0·80	—	"Fine quality pig of exceptional strength, yet easily machined. A small proportion in a mixture prevents brittleness in light castings."
		H	,, Nos. 1 and 2 ..	A	—	—	3·5	3·5	0·03	0·30	0·80	—	
		H	,, No. 3	A	—	—	3·5	3·0	0·04	0·30	0·80	—	
		H	,, ,, 4	A	—	—	3·5	2·5	0·05	0·30	0·80	—	
		H	,, Close	A	—	—	3·5	2·0	0·06	0·30	0·80	—	
		R	This firm also "is producing *Refined Pig-Iron* to the required specification containing certain percentages of nickel, chrome and nickel-chrome."										
		Electric Alloy	It is also marketing an *Electric Furnace Pig* containing small quantities of Vanadium and Titanium which "promote soundness and improve the strength." *It publishes in its pamphlet* an alphabetical list of castings, and shows the analyses of cast iron recommended for them. Also it gives certain charts (diagrams), and describes a system for calculating mixtures.						
77	N. HINGLEY & SONS, LTD., Dudley, WORCS.	?	N.B. LION	A	—	—	3·4	1·9	0·08	0·75	0·85	—	(Furnaces closed on November 12, 1929.)
		?	,, ,, ...	R	—	—	3·3—3·5	1·3—2·5	0·07—0·10	0·60—0·80	0·80—1·00	—	
78	WILLINGSWORTH IRON CO., LTD., near WEDNESBURY.	—		—	"Plant has been standing since 1919."								
79	WEST MIDLAND REFINING CO., Bilston, STAFFS.	—		—	Advertising December, 1929, but they are not on the F.T.J. list.								

District "M"—North Wales.

80	BRYMBO STEEL CO., LTD., near WREXHAM.	—		—	"As we never make any foundry iron, but confine ourselves to highly phosphoric basic iron, we fear any information we could supply would be useless for your purpose."								
81	DARWEN & MOSTYN IRON CO., LTD. (Mostyn Works).	—		—	See also "E" Lancashire for Darwen. No reply in either case. One furnace showing working on ferro-manganese, September 30 and December 31, 1929.								

District "N"—Shropshire.

82	THE LILLESHALL CO., LTD., Prior's Lee Hall, near SHIFNALL.		"LILLESHALL LODGE"—										All analyses *approximate.*
		C	No. 1	A	0·30	3·25	(3·55)	2·50	0·045	0·50	1·00	—	
		C	No. 2	A	0·50	3·00	(3·50)	2·00	0·045	0·50	1·00	—	"For chilled rolls and chilled castings of every description."
		C	No. 3	A	0·60	2·80	(3·40)	1·75	0·050	0·50	0·80	—	
		C	No. 4	A	0·65	2·75	(3·40)	1·50	0·055	0·50	0·80	—	"Pig selected to throw ¼ in., ⅜ in., ½ in., ¾ in., 1 in., 1¼ in. and 1½-in. chills."
		C	No. 4 Close (Cylinder)	A–R	0·60	2·65	(3·25)	1·25	0·060	0·50	0·75—0·90	—	
		C	No. 5 (Cylinder)	A–R	0·57	2·55	(3·12)	1·25	0·08	0·50	0·75—0·90	—	"*Cylinder* qualities for gas engines, locomotive, marine Diesel engines, and motor cylinders, &c."
		C	Chilling	A–R	0·65	2·50	(3·15)	0·75—1·00	0·08—0·10	0·55	0·70—0·80	—	
		C	Mottled	A–R	0·75	2·50	(3·25)	0·60—0·80	0·08—0·125	0·55	0·90	—	
			"LILLESHALL ALL MINE"—										
		H	No. 1	A	0·25	3·25	(3·50)	3·00	0·03	0·60	0·80	—	—
		H	No. 2	A	0·40	3·00	(3·40)	2·50	0·035	0·60	0·80	—	—
		H	No. 3	A	0·45	2·80	(3·25)	2·25	0·04	0·60	0·80	—	—
		H	No. 4	A	0·50	2·75	(3·25)	1·75	0·04	0·5—0·60	0·70	—	—
		H	No. 4 Close (Cylinder)	A	0·60	2·65	(3·25)	1·50	0·05	0·5	0·70	—	—
		H	No. 5 (Cylinder)	A	0·65	2·60	(3·25)	1·50—2·25	0·08	0·5	0·80	—	—
		H	Special Cylinder	A	0·60	2·50	(3·10)	1·20—1·50	0·08	0·5	1·00	—	"For internal combustion."
		H	No. 6	A	0·50	2·50	(3·00)	1·00	0·10—0.12	0·5	0·65	—	—
		H	Rex	A	0·65	2·55	(3·20)	1·25—1·75	0·06	0·5	1·2—1·5	—	"Suitable for high-class motor-cylinder work—for internal combustion."

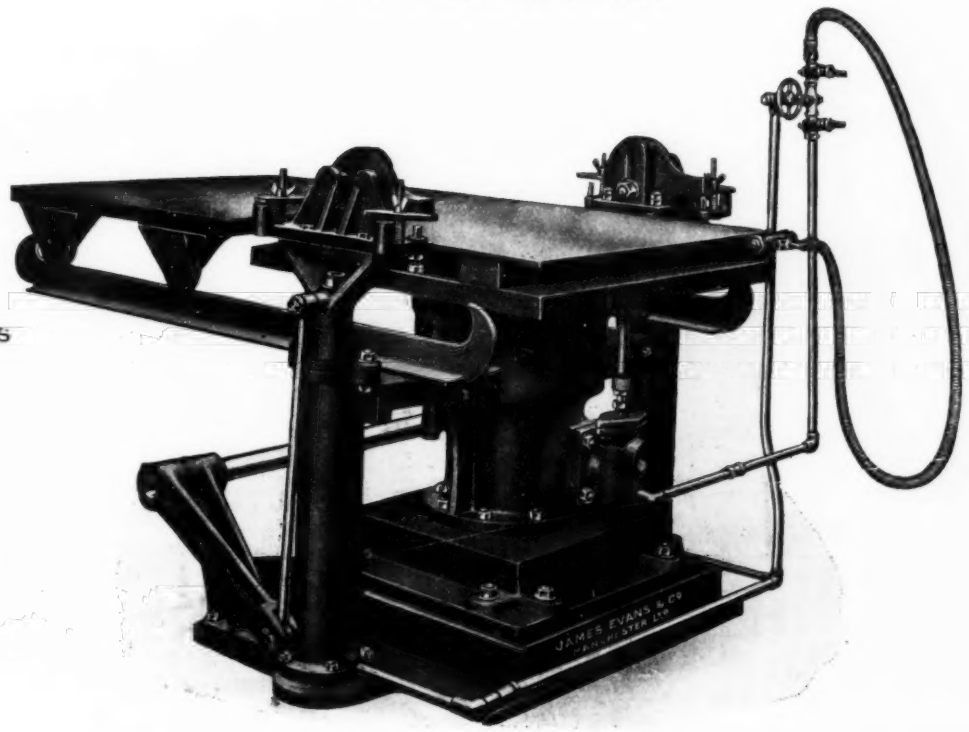
TYPE "C"

JAR RAM MOULDING MACHINE

with Turnover Pattern Plate.

For Pneumatic Power.

TWO MACHINES IN ONE.



UNSKILLED LABOUR ONLY REQUIRED.

The above machine illustrates a Jar Ram Machine with Turnover Pattern Plate which can also be used for Stripping Plate Work.

The machine has been designed to combine the two distinct features above mentioned, and is practically two machines in one, equally suitable for steel, iron, etc.

The machine as illustrated is arranged for work that requires turning over, such as steel moulding. And while the turnover arrangements are intended for general repetition work, by detaching the turnover plate from the trunnion brackets the machine can be used for stripping plate work by attaching the stripping plate to the trunnion brackets. Or, on the other hand, by removing the trunnion brackets as well, the table can be used for jolting general jobbing work.

A very important feature of the machine is the simplicity with which the intensity of the Jolt can be regulated when the operator has become accustomed to the use of the machine, which takes but an hour or so. The valves all being on the exterior of the machine are easily accessible, and there is an adjustable arrangement that will allow the jolt to be varied between 1½ in. to below ½ in. This being done without disturbing any part of the machine.

The machine is supplied with Withdrawal Carriage, Vibrator, and Blow-off Nozzle complete. It is substantially constructed to stand heavy wear and tear, and requires a minimum amount of skill to operate.

Another important feature of the machine is in the arrangement of the hard wood anvil block for receiving the shock. The blocks being carried well down the machine in a specially designed annular chamber give considerable relief to the foundations. It also provides against the possibility of fracturing the jolting table. Pitch pine blocks are also inserted between the foundation plate and the machine bedplate to assist in the relief on the foundations, and these features considerably improve the working advantages of the machine.

IT IS ALSO ENTIRELY OF BRITISH DESIGN AND MANUFACTURE.

JAMES EVANS & CO. (M/c) LTD.

Britannia Works, BLACKFRIARS, MANCHESTER.

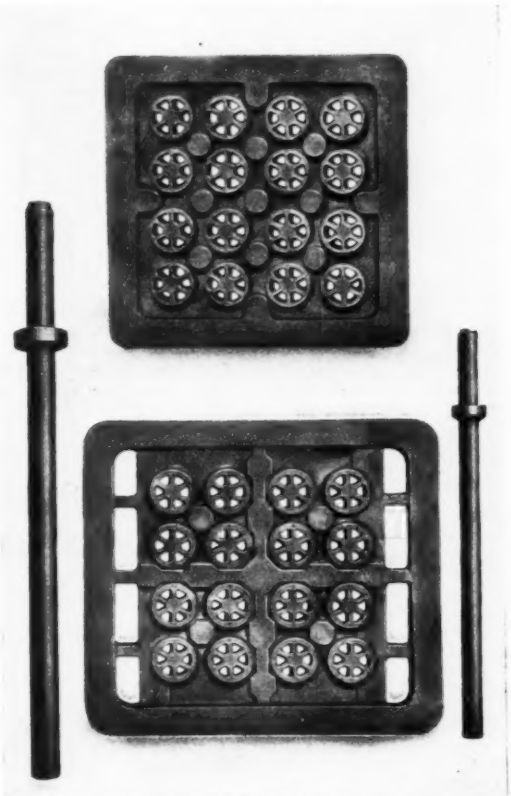
District "O"—South Wales and Monmouthshire.

No. Index	Firm or Works.	Type.	Designation, Grade or Brand.		COMPOSITION. C. Combd.	C. Gr.	C. Total.	Si.	S.	P.	Mn.	Other Constituents.	Remarks.
83	"THE BRITON FERRY WORKS, LTD.," Briton Ferry, S. WALES.	H	BESSEMER No. 1 FOUNDRY	A	0·20	3·60	3·80	2·80	0·02	0·06	1·20	—	—
		H	„ „ „ ..	R	—	—	—	2·50—3·25	0·015—0·025	0·06—0·06	—	—	—
		H	„ No. 2 „ ..	A	0·25	3·30	3·55	—	0·035	0·06	1·10	—	—
		H	„ „ „ ..	R	—	—	—	2·0—2·5	0·025—0·045	0·06—0·06	—	—	—
		H	„ No. 3 „ ..	A	0·36	3·10	3·46	—	0·051	0·06	1·00	—	—
		H	„ „ „ ..	R	—	—	—	1·5—2·0	0·045—0·06	0·06—0·06	—	—	—
		H	„ No. 4 FORGE ..	A	0·50	2·80	3·30	1·5	0·08	0·06 max.	0·90	—	—
84	THE BRITISH (GUEST, KEEN, BALDWIN'S) IRON & STEEL CO., LTD., CARDIFF.	H	CARDIFF Special Foundry—										
			No. 1	A-R	0·12	3·40	(3·52)	2·75—3·00	0·03 max.	0·4—0·8	0·5—0·9	—	—
			No. 2	A-R	0·20	3·35	(3·55)	2·25—2·75	0·04 „	0·4—0·8	0·5—0·9	—	—
			No. 3	A-R	0·30	3·25	(3·55)	2·0—2·50	0·05 „	0·4—0·8	0·5—0·9	—	—
	BALDWINS, LTD., Baldwin House, Great Trinity Lane, LONDON, E.C.4. *See also* 85.		"Do not make foundry iron at Port Talbot."										
85	GUEST, KEEN, NETTLEFOLDS, DOWLAIS, East Moors, CARDIFF, CWMBRAN, MON.	H	HEMATITE	A	0·40	3·75	4·15	2·25	0·03	0·065	0·90	—	—
		H	„	R	0·30—0·50	3·6—3·9	3·9—4·2	2·0—2·5	0·025—0·035	0·06—0·07	0·80—1·20	—	—
		H	HIGH PHOSPHORUS Foundry	A	0·20	3·8	4·0	2·75	0·035	0·65	0·70	—	—
		H	„ „ „	R	0·10—0·30	3·6—4·0	3·7—4·3	2·5—3·0	0·03—0·04	0·50—0·80	0·60—0·90	—	—
		H	LOW PHOSPHORUS Foundry	A	0·20	3·8	4·0	2·75	0·030	0·30	0·70	—	—
		H	„ „ „	R	0·10—0·30	3·6—4·0	3·8—4·3	2·5—3·00	0·025—0·035	0·20—0·40	0·50—0·90	—	—
86	EBBW VALE STEEL, IRON & COAL CO., LTD., Ebbw Vale, MON.	H	BESSR. HEMATITE	A	0·40	3·50	3·90	2·00	0·06	0·08	1·00	—	—
		H	„ „	R	—	—	—	1·75—2·25	0·03—0·09	0·07—0·09	0·80—1·20	—	—
		H	BASIC	A	3·00	0·80	3·80	1·00	0·08	1·00	1·80	—	—
		H	„	R	—	—	—	0·75—1·25	0·06—0·10	0·80—1·20	1·50—2·10	—	—
87	BLAENAVON CO., LTD., Blaenavon, MON.		No reply. Not working September 30 or December 31, 1929.										

Addenda—District "L"—South Staffordshire.

71	G. & R. THOMAS, LTD., Hatherton, BILOXWICH.	C	S/S COLDBLAST "Thomas CB"	R	0·4—1·0	2·2—3·1	3·0—3·4	0·6—1·2	0·08—0·16	0·5—0·75	0·65—0·75	Fe 95·17 to 93·74	"Arsenic. Merest trace. Figs. given, outside, covering grey to close. Between figs. vary according to number of grade. CB, used chiefly for chilled roll making. G. & R. T. special, similar but made with "Coddled" blast T. Specially adapted for stress and wearing surfaces. Much used for loco. cylinders, hydraulic and engineering work requiring specially reliable endurance."
		H	SP. ALL-MINE. "G. & R. T. Special" (1,500 deg. Fah.) ..	R	0·2—0·9	2·5—3·5	3·3—3·72	0·8—2·0	0·045—0·12	0·5—0·75	0·6—0·75	Fe 94·755 to 92·68	
		W	ORDINARY ALL-MINE. "G. & R. T. Titan"	R	0·1—0·08	2·8—3·6	3·4—3·8	0·8—2·5	0·03—0·10	0·45—0·65	0·35—0·75	Fe 94·97 to 92·2	

F.T.J. 5/9/30.



Lightest of the bronzes

Aluminium bronze is highly resistant to acid attack and to oxidation at red heat. It excels also in resistance to shock and to prolonged fatigue stresses.

In its simplest form (10% Al., 90% Cu.) this alloy has a specific gravity of 7.5, and in the sand cast state a tensile strength of over 30 tons per sq. in. with an elongation of 25%.

The illustration shows Acid Resisting Pump Rods and Valve Plates. Sand cast in Aluminium Bronze for the Standard Oil Co.

The demand for this book has necessitated a second impression—now ready. Have you had a copy?

Aluminium Bronze

THE BRITISH ALUMINIUM CO.,
Head Office:
Adelaide House, King William Street, London, E.C.4.

MOULDING SAND

OF THE FINEST QUALITY

For Brass, Iron, Steel or Aluminium Castings.

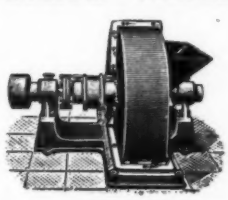
ALSO PIG BED & BUILDING SAND.

The Mansfield Sand Co., LTD.

MANSFIELD, NOTTS.

Tel.: 36 Mansfield.

THE "BREAKIR" IS THE MOST SIMPLE, RELIABLE, AND EFFICIENT **SAND MIXER** ON THE MARKET



LOW **power consumption.**

CLEAN **and sounder Castings, therefore a good investment.**

CAPACITIES:
1 to 6 tons per hour.

Ask for Illustrated List.

W. BREALEY & CO., LTD.

"Prospect Works," Hawksley Avenue, SHEFFIELD.

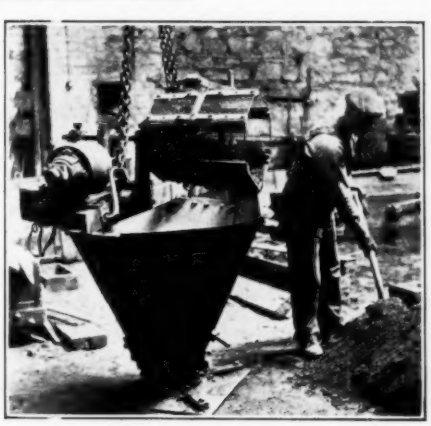
PORTABLE SAND HOPPER & RIDDLE

FOR NEW OR FLOOR SAND

CAPACITY 12 cwts. 3-3½ TONS RIDDLED per HOUR

ALSO MAKERS OF MACHINES FOR RUNNING UP LOAM CORES ON BARRELS. ANY DIAMETER. ANY LENGTH.

ASK FOR OUR UP-TO-DATE METHOD OF HEATING LADLES & SHANKS AND DRYING FLOOR MOULDS WITH GAS & AIR.



Manufacturers:

RITCHIE, HART & Co. Ld.

ENGINEERS, IRON & BRASS FOUNDERS.

MOUNTPOTTINGER FOUNDRY, BELFAST

Trade Talk.

Employees of Messrs. Anderson Boyes & Company, Limited, Flemington, Motherwell, have contributed the sum of £200 to local infirmaries and institutions.

The Fullwood Foundry Company, Limited, of Mossend, posted notices intimating that full-time operation would be resumed at the end of August. The foundry has been closed since July 16 owing to lack of orders.

The Ailsa Shipbuilding Company, Limited, of Troon and Ayr, have been invited to tender for the construction of four cargo steamers with limited passenger accommodation, intended for service between Great Britain and Holland.

The Dorman Long Holdings Trust has been registered as a private company to carry on the business of an investment trust company. The nominal capital is £1,000 in £1 shares. The directors are the directors for the time being of Messrs. Dorman, Long & Company.

Messrs. Lithgows, Limited, of Port Glasgow, launched a single-screw steamer, "Princ Andrej," built for Messrs. Dubrovacka Parobrodska Plovidba, Dubrovnik. The vessel is fitted with all approved appliances for the rapid handling of cargo. Messrs. Rankin & Blackmore, Greenock, are supplying triple-expansion engines.

The Dowlais steelworks of the British (Guest Keen Baldwins) Iron & Steel Company, Limited, after a stoppage lasting six weeks, brought about by scarcity of orders consequent on foreign undercutting, have restarted operations. It is hoped that employment will be available for the 1,600 workmen who have been idle.

The 1,001st ship to be built by Messrs. Palmers Shipbuilding & Iron Company, Limited, the motor vessel "Cheyenne," constructed for the Anglo-American Oil Company, was launched from the Jarrow shipyard on August 22. With a deadweight of 12,300 tons, the "Cheyenne" is one of the largest oil tankers afloat.

Referring to our note last week to the effect that the "Phœnix" electro lifting magnet business recently acquired by Messrs. W. E. Burnand & Company, Sheffield, from Messrs. Steel, Peech & Tozer, we are asked to announce that the sole selling agency is still continued by Messrs. Appleby & Company, 70, Victoria Street, Westminster, London, S.W.1.

The North British Locomotive Company, Limited, have found it necessary to suspend a considerable number of their workers at the Queen's Park Works, Podmadie, Glasgow. These works are just starting on an order for 25 tank engines, which can be completed at the rate of five a week. The suspended workers will be recalled as soon as the work permits.

The International (Continental) Raw Steel Cartel has now released structural iron and half the manufactured products from price control. In effect, the cartel is virtually dissolved, and members state that they are compelled to take this step by the increasing competition of manufacturers outside the cartel, especially of British manufacturers, who, it is declared, persistently underbid Continental manufacturers.

Arrangements have been completed with the London & North-Eastern Railway to convey 1,000 tons of electrical equipment from Newcastle-upon-Tyne to Ymuiden, Holland, *via* the Harwich-Zeebrugge train ferry. This equipment consists of two turbo-alternators, complete with condensing plant, which Messrs. C. A. Parsons & Company, Limited, are manufacturing for the Provincial Electriciteits-bedryf Van Noord

The installation of hot-water radiator heating throughout the new Doncaster Infirmary—opened on August 21 by Lord Lonsdale—together with constant hot-water supply and sterilising plant, was supplied by the Brightside Foundry & Engineering Company, Limited, of Sheffield. All the equipment of the installation, including piping, pumps, sterilising outfit and calorifiers (of cast iron, treated against rust), was made on the company's works at Sheffield.

The Ford Motor Company has placed a contract with the Dominion Iron & Steel Company, of Sydney, N.S., for a large tonnage of iron ore, to be shipped from the company's mine at Wabana, Newfoundland, to the new Ford works at Dagenham. During October and November, 1931, 32,000 tons will be shipped, and from May to November, 1932, 80,000 tons. Special quays will be constructed on the Thames for the rapid unloading of the ore.

A National Railway week, in celebration of the centenary of the opening of the Liverpool and Manchester Railway is to be held in Liverpool from September 13 to 20. In connection with the centenary celebrations, a lecture will be given at the Manchester Literary and Philosophical Society, 36, George Street, Manchester, on Friday, September 19, on the subject of "The Rainhill Locomotive Trials of 1829," by Mr. Dendy Marshall, M.A., M.I.Loco.E.

Messrs. Henry Robb, Limited, of Leith, have launched the "Tarrafal," built to the order of Messrs. Hall, Blyth & Company, Limited, Hull, for Messrs. Serro Cia, Limited, St. Vincent, Cape Verde Island. The vessel is designed for the transportation of fresh water, and large tanks are constructed on the longitudinal system of framing. Propelling machinery consists of compound surface-condensing engines, steam being supplied by marine return-tube type of boilers.

Schemes costing over £2,600,000 will be in progress this winter on the L.M.S. Railway system. The schemes include the widening of lines at several key points, while goods terminal accommodation and facilities are to be improved at certain important centres, such as Camden Town (London), Birmingham, Great Bridge and Stoke-on-Trent. Dock improvement and modernisation works are in progress at Ayr, Troon, Grangemouth, Fleetwood, Goole, Garston and Swansea.

Sir Joseph Calvert, chairman of the Middlesbrough and District Employment Committee, has suggested a scheme which he has put before the Ministry of Labour for the alleviation of unemployment in the iron and steel trade on Tees-side. He contends that the world is not using all the pig-iron it really needs. He says that if the Government gave the ironmasters sufficient credit and told them to go ahead, and put in more furnaces and produce pig-iron for stock against the more prosperous period that is coming, they would actually save money. Sir Joseph estimates that the scheme would take 8,000 Tees-side men from the unemployed list.

The Amalgamated Metal Corporation, Limited, which holds all the shares of the British Metal Corporation, Limited, and Messrs. Henry Gardner & Company, Limited, is to increase its capital to £5,600,000 by the creation of 600,000 new £1 ordinary shares. The increase is being made to carry out an exchange of shares with important German and Belgian companies. In the case of the German company, Metallgesellschaft, the number of the Corporation's shares to be exchanged is 600,000, and in the case of the Belgian company, Société Générale des Minerais, 225,000 shares will be exchanged. The latter company will also subscribe for 100,000 ordinary shares of the Corporation at par.

Personal.

Mr. H. J. Freyn, president of the Freyn Engineering Company, Chicago, U.S.A., is now visiting England, Germany and the U.S.S.R. He will visit the Leningrad branch of his company in connection with the consulting services it is rendering to the Soviet iron and steel industry.

Mr. and Mrs. T. Godfrey, of Stenhousemuir, celebrated the 50th anniversary of their wedding on August 27. Mr. Godfrey was originally a moulder in the Saracen Foundry, Glasgow, and went to the Carron Company about 46 years ago, and afterwards was employed with the Falkirk Iron Company, Limited.

Wills.

Ford, B., machinery and metal merchant, of Scotstoun, Glasgow £8,009

Henderson, Laurence, of Messrs. Nielson & Maxwell, Limited, iron and steel merchants £31,585

Atkins, W., chairman of Atkins Metal, Limited, metal merchants and manufacturers, of Birmingham £117,641

Brazing Cast Iron.—A good flux, when brazing cast iron, can be made from the following:—Boric acid 8 ozs., pulverised chloride of potash 2½ ozs., carbonate of iron 2 ozs. When storing, keep in a thoroughly dry place. Before starting the actual brazing, mix the flux thoroughly with spelter. The most efficient brazing solder for cast iron is brazing brass sheet. Bronze, however, can be used with success in many cases.

Patent Specifications Accepted.

The following list of Patent Specifications accepted has been taken from the "Illustrated Official Journal (Patents)." Printed copies of the full Specifications are obtainable from the Patent Office, 25, Southampton Buildings, London, W.C.2, price 1s. each. The last numbers given are those under which the Specifications will be printed and abridged, and all subsequent proceedings will be taken.

12,367. Rasselsteiner Eisenwerks-Ges. Akt.-Ges., and Främbs, H. Production of tinplate. 310,061.

12,889. I. G. Farbenindustrie Akt.-Ges. Process for the recovery of copper from spent copper lyes. 310,425.

13,798. Metallges. Akt.-Ges., Forster, H. Von, and Lay, E. Bright-annealing metals. 332,656.

15,772. Vereinigte Aluminium-Werke Akt.-Ges. Method of removing gases from molten light metals, such as aluminium and its alloys. 313,489.

18,595. Penicud, J. W. Crucible furnaces. 332,701.

23,490. Humphris, F. Cutting of blanks from metal or other sheets. 332,752.

26,851. Vereinigte Stahlwerke Akt.-Ges., and Schreiber, E. Gas-fired metal-heating furnaces. 318,552.

33,784. Alberts, W. Metallurgical furnaces. 332,850.

36,688. Air Reduction Company, Inc. Production of scale-free welded tubing. 332,869.

37,176. Meyer-Keller et Cie Akt.-Ges. Manufacture of corrugated tubes. 332,870.

Obituary.

Mr. Francis W. Rodger, factory manager at the Glasgow shipyard of Messrs. Harland & Wolff, Limited, died recently. He had 40 years' service with the firm, beginning in the shipyard drawing office at Belfast in 1890. In 1917 he was promoted from the position of outside assistant manager at Queen's Island to that of factory manager at Govan.

The death has occurred of Mr. John Todd, who, though better known as Dangerous Structure Surveyor to the Corporation of London, was the owner of the J. E. Renshaw Foundry, Mill Mead, Staines. It was he who served the notice upon the Dean and Chapter of St. Paul's. The foundry which he owned was modernised under his regime. The Institute of British Foundrymen was represented at the funeral by the President of the London Section, Mr. A F. Gibbs.

Belgian Semi-Products Corporation.

The Semi-Steel Products Corporation of Belgium, Limited, has been established to deal exclusively with the sale of billets, blooms, slabs, sheet bars, and tinplate bars destined for this country and manufactured by the following works:—Angleur-Athus, S.A.; Usines Gustave Boel, S.A.; John Cockerill, S.A.; Métallurgique D'Esperance-Longdoz, S.A.; Usines Métallurgiques de Hainault, S.A.; Forges de la Providence, S.A.; Métallurgique de Sambre et Moselle, S.A.; Acièries de Thy-Le-Chateau & Marcinelle, S.A.

The offices of the Corporation are at Staple House, 51-52, Chancery Lane, London, W.C.2. Sales of semis in this country will be handled centrally by the Corporation on behalf of the eight works, and the orders passed on to the works' organisation in Belgium, which will apportion them among the various mills. So far as this country is concerned, sales of Belgian semi-products have thus been centralised in two main organisations: the Semi-Products Corporation of Belgium, acting on behalf of the eight works mentioned, and the commercial organisation of the Ougrée-Marihaye group. There is provision for the regularisation, in Belgium, of the tonnage of the two groups.

It is claimed that this centralisation of sales gives better service to the consumer. Also, prompt deliveries can be offered.

Telephones:
SHEFFIELD 22311 (3 lines)
LONDON 1483 Central
GLASGOW South 1580
WORKSOP 205
AMBERGATE 7
STOCKSBRIDGE 27
GALSTON 49

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MANUFACTURERS & PRODUCERS OF REFRACTORY MATERIALS OF EVERY DESCRIPTION
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AND AT MANSFIELD, WARSOP, EBBERSTON, CORBRIDGE, BRAMCOTE, LUFFENHAM, TOW LAW, MONTGREENAN &c.&c.

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STEELFOUNDERS

please remember

WE SELL SAND

BUT

WE GIVE SERVICE

Our experience and advice on Sand subjects are freely at your disposal. It may be that we can help you if you give us an opportunity.

NOTE:—EXTRA STRONG "YORKSHIRE SAND" is highly concentrated and will carry more floor or mixing sand than any other sand in the world.

Iron and Steel Markets.

Pig-Iron.

MIDDLESBROUGH.—Contemporary with the termination of the holiday season on Tees-side, in combination with the substantial reduction in pig-iron prices by the Cleveland ironmasters, the weekly markets reflect a more active tendency, and inquiries are now beginning to circulate on an improved scale. It is, however, by no means suggested that business is once more in full swing. On the contrary, there is still room for further expansion before available supplies are fully absorbed, even on the basis of the present limited output. In this connection it is not without significance that there has been a spurt in shipments from the Tees of late, and although export business is still extremely difficult to negotiate in the face of competition from producers abroad there is no doubt that the fall in prices will ensure in the long run a broadening of the area of distribution of Cleveland iron. Hopes of expansion are mainly based on the fact that it is now tolerably certain that prices have reached rock bottom. The fall in values was bound to have an end, and the belief is general that price-cutting can go no further. Meanwhile, prices are steady, quotations for Cleveland iron, both to home and foreign buyers, being as follow:—No. 1 foundry iron, 66s.; No. 3 G.M.B., 63s. 6d.; No. 4 foundry, 62s. 6d.; No. 4 forge, 62s. per ton.

The market for East Coast hematite discloses little improvement from the irregular condition recently prevailing. Demand is still lethargic, but the outlook is rather more hopeful, since output has been drastically reduced and makers are less disposed to cut-throat competition in order to attract business. Generally, they adhere to quotations of 71s. per ton for mixed numbers and 71s. 6d. for No. 1 quality. On the North-West Coast, Bessemer mixed numbers are quoted at 70s. per ton at works.

LANCASHIRE.—Conditions in the local markets for foundry pig have been sluggish in the extreme, few orders of any real consequence having been reported. It is satisfactory to note, however, that on the whole the tonnage of pig-iron going into consumption locally is about up to the level of a month or so ago. Quotations for Derbyshire and Staffordshire No. 3 are maintained at 72s. per ton, for delivery to local stations.

THE MIDLANDS.—Consumers of foundry iron in the Birmingham area at present are holding off markets as a rule, business in the light castings section being subject to seasonal variations. Certainly there have been a few more contracts placed, but these have not been for heavy tonnages, and most of the present business continues to be of a hand-to-mouth character. In the meantime the furnaces quote the minimum zone rates of 70s. for Northants No. 3 and 73s. 6d. for Derbyshire and Staffordshire No. 3, delivered local stations.

SCOTLAND.—The market for Scottish pig-iron is still in a very poor position. Founders generally are very short of orders, and most of them are working part time. The worst feature of the position is that no one can see any indication of a change for the better. There is no alteration in the price of No. 3 Scottish foundry iron, which remains at a minimum of 76s. 6d. f.o.t. furnaces.

Finished Iron.

Conditions in the manufacturing branches of the Black Country industries remain very dull and the ironworks are unable to secure sufficient orders to maintain regularity in operation at the mills. It is only in connection with Staffordshire marked bars that conditions keep on a fairly satisfactory basis, these bars being quoted at £12 10s. at makers' works. The value of crown bars varies from £10 to £10 5s., and nut and bolt iron is offered at about £9. The foreign iron used in this district for bolts and nuts, etc., is offered at £5 12s. 6d. to £5 17s. 6d. delivered.

Steel.

Unsettled conditions continue to rule in the semi-finished steel department. The Continental steel makers claim that they are maintaining the official prices, but little business has been reported, and British buyers are still antagonistic to the Cartel's new selling arrangements. One consequence of this is that the British makers are securing a certain amount of business that formerly went to the Continent. The demand for finished steel appears to be improving slowly, but it is still rather spasmodic. There has been slightly more demand from home buyers of late, and the inquiry from overseas markets has been rather more active. The total volume of business has not been large, but it is sufficient to encourage hopes that a revival is at hand. The tinplate market is unchanged, the current quotation still ruling 18s. basis for coke quality, net cash, f.o.b. Welsh ports.

Scrap.

With the opening of the autumn season this week a more active tendency in demand for foundry scrap may be observable, as stocks in consumers' hands must now be running short. For their very limited needs, it would appear that all the big consumers on Tees-side are amply covered, and, until the outlook clarifies, they show no disposition to enter into fresh commitments. There are still sellers of ordinary heavy cast iron at 55s. per ton, though some sellers ask for rather a higher figure, and machinery quality in handy pieces is offered at 57s. 6d. In Scotland, machinery cast-iron scrap, suitable for foundries, is quoted 63s. 6d.; ordinary cast-iron scrap, to the same specification, is 57s. 6d., and for heavy steel works, cast in furnace sizes, the price is 52s. 6d. to 55s. Railway chairs are around 58s. 6d. to 60s., and light metal 45s. The above prices are all per ton delivered f.o.t. consumers' works.

Metals.

Copper.—The renewed activity on the Stock Exchange of late has not, so far, been reflected in markets for base metals, in which the demand for warrant copper continues below average even for the slack season. The position is still affected by the fact that European stocks of copper are at a minimum, but the contraction in United States deliveries has exceeded the cut in production, and stocks are so heavy that there can be little inducement for consumers to do more than cover their immediate wants.

Closing quotations :—

Cash.—Thursday, £46 16s. 3d. to £46 18s. 9d.; Friday, £47 6s. 3d. to £47 8s. 9d.; Monday, £47 13s. 9d. to £47 15s.; Tuesday, £47 11s. 3d. to £47 12s. 6d.; Wednesday, £47 11s. 3d. to £47 12s. 6d.

Three Months.—Thursday, £47 to £47 2s. 6d.; Friday, £47 6s. 3d. to £47 8s. 9d.; Monday, £47 16s. 3d. to £47 17s. 6d.; Tuesday, £47 11s. 3d. to £47 12s. 6d.; Wednesday, £47 11s 3d. to £47 12s. 6d.

Tin.—Disappointment is freely expressed in markets for standard tin at the long-continued absence of a brisk demand, as had been anticipated following the efforts of the Producers' Association to secure a more favourable result of their action to restrict outputs at the source. So far the low price at which this metal stands has done little to stimulate consumption, and an increase in visible supplies at the end of this month is indicated. The stock position in this country is extremely adverse, for reserves have been growing at the rate of something like 100 tons a day. The market is beginning to wonder how this huge accumulation of metal is going to be disposed of.

Official closing prices :—

Cash.—Thursday, £135 12s. 6d. to £135 15s.; Friday, £134 12s. 6d. to £134 15s.; Monday, £133 12s. 6d. to £133 15s.; Tuesday, £133 12s. 6d. to £133 15s.; Wednesday, £133 to £133 2s. 6d.

Three Months.—Thursday, £137 2s. 6d. to £137 5s.; Friday, £136 5s. to £136 7s. 6d.; Monday, £135 2s. 6d. to £135 5s.; Tuesday, £135 7s. 6d. to £135 10s.; Wednesday, £134 12s. 6d. to £134 15s.

Spelter.—The consumptive demand continues to be poor, and selling pressure on 'Change has driven the market down to a fresh low level. Production at existing levels is hardly profitable.

Daily fluctuations :—

Ordinary.—Thursday, £15 17s. 6d.; Friday, £16 1s. 3d.; Monday, £16 1s. 3d.; Tuesday, £16 2s. 6d.; Wednesday, £16 2s. 6d.

Lead.—Minor fluctuations have imparted a show of life to this market, but daily transactions on 'Change have not been large. Moderate buying by the Continent has helped, but consumers in this country have not shown much interest.

The week's prices have been :—

Soft Foreign (Prompt).—Thursday, £18 7s. 6d.; Friday, £18 13s. 9d.; Monday, £18 5s.; Tuesday, £18 5s.; Wednesday, £18 3s. 9d.

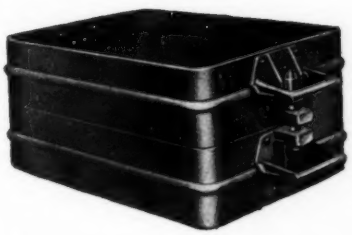
A FIRE HAS DONE considerable damage to the pattern-storage department of Messrs. Aveling & Porter, Limited, Rochester. Owing to their extensive trade ramifications, business will scarcely be interfered with.

GANISTER, CUPOLA BLOCKS, FIRE BRICKS,
FIRE CLAY.
Silica Bricks, Tuyeres, Stoppers, Nozzles, &c.
STEEL MOULDERS' COMPOSITION, SILICA CEMENT.

J. GRAYSON LOWOOD & CO., LTD.
DEEPCAR, nr. SHEFFIELD.
Telegrams: "LOWOOD, DEEPCAR."

Sterling

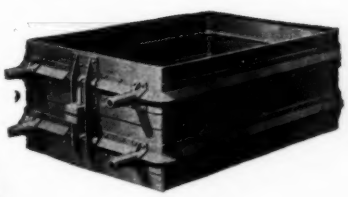
UP-TO-DATE MOULDING BOX EQUIPMENT.



STERLING
ROLLED STEEL
MOULDING BOXES

have been designed for THE MODERN FOUNDRY.

They are light and easy to handle.
Cannot crack or break.
Cannot spring.
Strong, Rigid, Durable and Permanently accurate.



BY ADOPTING STERLING BOXES IN YOUR FOUNDRY,

You will halve your moulding costs. You will increase production per man per hour, and reduce your box maintenance costs. You will turn out more accurate castings and thereby reduce your scrap and reject accounts. You will considerably reduce your fettling costs and put money into your pocket that is now running to waste.

STERLING BOXES save their cost in a few months and are obviously a sound investment for any foundry.

STERLING FOUNDRY SPECIALTIES Ltd.

Agents at:—London, Manchester, Newcastle and Glasgow.

BEDFORD.

WEEKLY PRICE CURRENT.

COPPER.

	£	s.	d.
Standard cash	47	11	3
Three months	47	11	3
Electrolytic	50	10	0
Tough	49	10	0
Best selected	50	0	0
Sheets	79	0	0
India	63	0	0
Wire bars	52	2	6
Do. September	52	2	6
Do. October	52	2	6
Ingot bars	52	2	6
H.C. wire rods	53	10	0
Off. av. cash, August	47	11	4½
Do., 3 mths., August	47	12	5½
Do., Sttlmnt., August	47	11	3
Do., Electro, August	51	4	6
Do., B.S., August	50	14	8¾
Do., wire bars, August	51	14	6
Solid drawn tubes			11½d.
Brazed tubes			11½d.
Wire			8½d.

BRASS.

Solid drawn tubes	10½d.
Brazed tubes	12½d.
Rods, drawn	10½d.
Rods, extd. or rlld.	6½d.
Sheets to 10 w.g.	8½d.
Wire	8½d.
Rolled metal	8½d.
Yellow metal rods	6½d.
Do. 4 × 4 Squares	7d.
Do. 4 × 3 Sheets	7½d.

TIN.

	£	s.	d.
Standard cash	133	0	0
Three months	134	12	6
English	134	10	0
Bars	136	15	0
Straits	135	5	0
Australian	135	0	0
Eastern	138	0	0
Banca	137	12	6
Off. av. cash, August	135	1	2¼
Do., 3 mths., August	136	14	6¾
Do., Sttlmt., August	135	1	6

SPELTER.

	£	s.	d.
Ordinary	16	2	6
Remelted	14	15	0
Hard	12	5	0
Electro 99.9	18	10	0
English	16	10	0
India	14	5	0
Zinc dust	22	0	0
Zinc ashes	4	0	0
Off. aver., August	16	4	2⅝
Aver., spot, August	15	19	0¼

LEAD.

	£	s.	d.
Soft foreign ppt.	18	3	9
English	19	10	0
Off. average, August	18	4	8⅛
Average spot, August	18	5	10½

ZINC SHEETS, &c.

	£	s.	d.
Zinc sheets, English	26	0	0
Do. V.M. ex-whf.	25	5	0
Rods	30	0	0
Boiler plates	21	0	0
Battery plates	22	10	0

ANTIMONY.

	£	s.	d.
Special brands, Eng.	38	0	0
Chinese	27	0	0
Crude	21	10	0

QUICKSILVER.

	£	s.	d.
Quicksilver	22	10	0

FERRO-ALLOYS AND STEEL-MAKING METALS.

Ferro-silicon—	
25%	7 17 6
45/50%	11 10 0
75%	18 10 0
Ferro-vanadium—	
35/50%	12/8 lb. Va.
Ferro-molybdenum—	
70/75% c. free	4/2 lb. Mo.
Ferro-tita um—	
23/ 5% carbon-free	11¾d. lb.
Ferro-phosphorus, 20/25%	£16 0 0
Ferro-tungsten—	
80/85%	2/3 lb.
Tungsten metal powder—	
98/99%	2/6 lb.
Ferro-chrome—	
2/4% car.	£30 10 0
4/6% car.	£23 10 0
6/8% car.	£22 7 6
8/10% car.	£22 0 0
Ferro-chrome—	
Max. 2% car.	£33 10 0
Max. 1% car.	£37 15 0
Max. 0.70% car.	£42 7 6
70%, carbon-free	11d. lb.
Nickel—99% cubes, or pellets	£175 0 0
Ferro-cobalt	9/7 lb.
Aluminium 98/99%	£95 0 0
Metallic chromium—	
96/98%	2/7 lb.
Ferro-manganese (net)—	
76/80% loose	£11 0 0 to £11 15 0
76/80% packed	£12 0 0 to £12 15 0
76/80% export	£11 0 0 to £11 15 0
Metallic manganese—	
94/96% carbonless	1/4 lb.

Per ton unless otherwise stated.

HIGH-SPEED TOOL STEEL.

Finished bars, 14% tungsten	£0 2 2
Finished bars, 18% tungsten	£0 3 0

Per lb. net, d/d buyers' works.

Extras—

Rounds and squares, 3 in. and over	4d. lb.
Rounds and squares, under ½ in. to ¼ in.	3d. lb.
Do., under ¼ in. to $\frac{3}{16}$ in.	1/- lb.
Flats, ½ in. × ¼ in. to under 1 in. × ¼ in.	3d. lb.
Do., under ½ in. × ¼ in.	1/- lb.
Bevels of approved sizes and sections	6d. lb.

Bars cut to length, 10% extra.

SCRAP.

South Wales—	£	s.	d.	£	s.	d.
Heavy steel				2	14	0
Bundled steel and shrngs.	2	10	0 to	2	13	0
Mixed iron and steel				2	7	6
Heavy cast iron	2	13	6 to	2	14	6
Good machinery for foundries	2	15	0 to	2	17	6

Cleveland—						
Heavy steel				2	7	6
Steel turnings				2	0	0
Cast-iron borings				1	15	0
Heavy forge				3	5	0
W.I. piling scrap				3	1	6
Cast-iron scrap	2	15	0 to	2	17	6

Midlands—						
Ord. cast-iron scrap				2	12	6
Heavy wrought				3	5	0
Steel turnings				1	7	0

Scotland—						
Heavy steel				2	13	6
Ordinary cast iron				2	17	6
Engineers' turnings				1	16	6
Cast-iron borings				1	13	9
Wrought-iron piling				3	8	9
Heavy machinery				3	3	6

London—Merchants' buying prices delivered yard.

Copper (clean)	43	0	0
Brass	32	0	0
Lead (less usual draft)	15	15	0
Tea lead	12	10	0
Zinc	9	10	0
New aluminium cuttings	56	0	0
Braziery copper	40	0	0
Gunmetal	42	0	0
Hollow pewter	100	0	0
Shaped black pewter	75	0	0

PIG-IRON.

(f.o.t. unless otherwise stated.)

N.E. Coast—	
Foundry No. 1	66/-
Foundry No. 3	63/6
Foundry No. 4	62/6
Forge No. 4	62/-
Hematite No. 1	71/6
Hematite M/Nos.	71/-
N.W. Coast—	
Hem. M/Nos. d/d Glas.	81/6
„ d/d Birm.	88/6
Midlands—	
Staffs. common*	—
„ No. 4 forge*	68/6
„ No. 3 fdry.*	73/6
Shrops. basic	—
„ Cold blast, ord.	—
„ „ roll iron	—
Northants forge*	65/-
„ fdry. No. 3*	70/-
Derbyshire forge*	68/6
„ fdry. No. 3*	73/6
„ basic*	—

*d/d Black Country dist.

Scotland—	
Foundry No. 1	79/-
„ No. 3	76/6
Hem. M/Nos.	78/-
Sheffield (d/d district)—	
Derby forge	63/6
„ fdry. No. 3	68/6
Lincs. forge	—
„ fdry. No. 3	70/-
E.C. hematite	83/6
W.C. hematite	86/6
Lincs. (at furnaces)—	
Forge No. 4	—
Foundry No. 3	—
Basic	—
Lancashire (d/d eq. Man.)—	
Derby forge	67/-
„ fdry. No. 3	72/-
Staffs foundry No. 3	72/-
Dalzell, No. 3 (special)	105/- to 107/6
Summerlee, No. 3	93/- to 94/-
Glengarnock, No. 3	—
Eglinton, No. 3	93/- to 94/-
Gartsherrie, No. 3	93/- to 94/-
Monkland, No. 3	93/- to 94/-
Shotts, No. 3	93/- to 94/-

FINISHED IRON AND STEEL.

Usual District deliveries for iron; delivered consumers' station for steel.

Iron—	£	s.	d.	£	s.	d.
Bars (cr.)				10	15	0
Nut and bolt iron	9	0	0 to	9	5	0
Hoops	10	15	0 to	12	0	0
Marked bars (Staffs) f.o.t.				12	10	0
Gas strip	10	15	0 to	12	0	0
Bolts and nuts, ½ in. × 4 in.				15	5	0

Steel—						
Ship plates	8	15	0 to	8	17	6
Boiler plts.	9	15	0 to	10	10	0
Chequer plts.				10	12	6
Angles				8	7	6
Tees				9	7	6
Joists				8	10	0
Rounds and squares, 3 in. to 5½ in.				9	7	6
Rounds under 3 in. to ½ in. (Untested)				7	15	0

and upwards

Flats—8 in. wide and over	8	12	6
„ under 8 in. and over 5 in.	8	17	6
Rails, heavy	8	10	0
Fishplates	12	0	0
Hoops (Staffs)	9 5	0 to 9	15 0
Black sheets, 24 g.	9 12	6 to 9	15 0
Galv.cor.shts., 24g.	11	17	6
Galv. fencing wire, 8g. plain	12	0	0
Billets, soft	5 15	0 to 6	5 0
Billets, hard	7 10	0 to 8	0 0
Sheet bars	5 15	0 to 6	0 0
Tin bars	6 0	0 to 6	3 9

PHOSPHOR BRONZE.

	Per lb. basis.
Strip	1/0¾
Sheet to 10 w.g.	1/1½
Wire	1/1¾
Rods	1/1
Tubes	1/5¾
Castings	1/1½

Delivery 3 cwt. free.
10% phos. cop. £30 above B.S.
15% phos. cop. £35 above B.S.
Phosphor tin (5%) £30 above price of English ingots.
C. CLIFFORD & SON, LIMITED.

NICKEL SILVER, &c.

	per lb.
Ingots for raising	8d. to 1/2
Rolled—	
To 9 in. wide	1/2 to 1/8
To 12 in. wide	1/2½ to 1/8½
To 15 in. wide	1/2½ to 1/8½
To 18 in. wide	1/3 to 1/9
To 21 in. wide	1/3½ to 1/9½
To 25 in. wide	1/4 to 1/10
Ingots for spoons and forks	8d. to 1/4½
Ingots rolled to spoon size	11d. to 1/7½
Wire round—	
3/0 to 10 G.	1/5½ to 2/0½

with extras according to gauge.

AMERICAN IRON AND STEEL.

At Pittsburgh unless otherwise stated.

	Dols.
No. 2 foundry, Phila.	19.76
No. 2 foundry, Valley	18.00
No. 2 foundry, Birm.	14.00
Basic	19.76
Bessemer	20.26
Malleable	20.26
Grey forge	19.26
Ferro-mang. 80%	94.00
O.-h. rails, h'y, at mill	43.00
Billets	31.00
Sheet bars	31.00
Wire rods	36.00
	Cents.
Iron bars, Phila.	2.09
Steel bars	1.65
Tank plates	1.60
Beams, etc.	1.60
Skelp, grooved steel	1.70
Skelp, sheared steel	1.70
Steel hoops	1.95
Sheets, black, No. 24	2.45
Sheets, galv., No. 24	3.05
Sheets, blue an'l'd, No. 13	2.05
Wire nails	2.05
Plain wire	2.30
Barbed wire, galv.	2.80
Tinplates, 100-lb. box	$5.25

COKE (at ovens).

Welsh foundry	25/- to 27/6
„ furnace	17/- to 21/6
Durham and Northumberland—	
„ foundry	14/- to 14/6
„ furnace	14/- to 14/6
Midlands, foundry	—
„ furnace	—

TINPLATES.

f.o.b. Bristol Channel ports.

I.C. cokes	20×14 box		18/-
„	28×20 „		36/-
„	20×10 „		26/-
„	18¼×14 „		18/9
C.W.	20×14 „		16/-
„	28×20 „		33/6
„	20×10 „		23/6
„	18¼×14 „		17/-
Terneplates	28×20		32/6 per box basis f.o.b.

SWEDISH CHARCOAL IRON & STEEL.

Pig-iron	£6	0	0	to	£7	10	0
Bars, hammered, basis	£17	10	0	to	£18	10	0
Bars and nail-rods, rolled, basis	£15	17	6	to	£16	15	0
Blooms	£10	0	0	to	£12	0	0
Keg steel	£32	0	0	to	£33	0	0
Faggot steel	£20	0	0	to	£24	0	0
Bars and rods dead soft, steel	£11	0	0	to	£14	0	0

All per English ton, f.o.b. Gothenburg.

TUBES AND FITTINGS.

Over ½ in. up to 6 in.

	Tubes.	*Fittings.*
Gas	62½%	47½%
Water ..	58¾%	42½%
Steam ..	55%	37½%

W.I. 12½% extra.

DAILY FLUCTUATIONS.

Standard Copper (cash).

		£	s.	d.	
Aug.	28 ..	46	16	3	No change
,,	29 ..	47	6	3	inc. 10/-
Sept.	1 ..	47	13	9	,, 7/6
,,	2 ..	47	11	3	dec. 2/6
,,	3 ..	47	11	3	No change

Electrolytic Copper.

		£	s.	d.	
Aug.	28 ..	50	10	0	No change
,,	29 ..	50	10	0	,, ,,
Sept.	1 ..	50	10	0	,, ,,
,,	2 ..	50	10	0	,, ,,
,,	3 ..	50	10	0	,, ,,

Standard Tin (cash).

		£	s.	d.	
Aug.	28 ..	135	12	6	inc. 45/-
,,	29 ..	134	12	6	dec. 20/-
Sept.	1 ..	133	12	6	,, 20/-
,,	2 ..	133	12	6	No change
,,	3 ..	133	0	0	dec. 12/6

Tin (English ingots).

		£	s.	d.	
Aug.	28 ..	136	15	0	inc. 40/-
,,	29 ..	135	15	0	dec. 20/-
Sept.	1 ..	134	15	0	,, 20/-
,,	2 ..	134	15	0	No change
,,	3 ..	134	10	0	dec. 5/-

Zinc Sheets (English).

		£	s.	d.	
Aug.	28 ..	26	0	0	No change
,,	29 ..	26	0	0	,, ,,
Sept.	1 ..	26	0	0	,, ,,
,,	2 ..	26	0	0	,, ,,
,,	3 ..	26	0	0	,, ,,

Spelter (ordinary).

		£	s.	d.	
Aug.	28 ..	15	17	6	No change
,,	29 ..	16	1	3	inc. 3/9
Sept.	1 ..	16	1	3	No change
,,	2 ..	16	2	6	inc. 1/2
,,	3 ..	16	2	6	No change

Lead (English).

		£	s.	d.	
Aug.	28 ..	19	10	0	No change
,,	29 ..	19	15	0	inc. 5/-
Sept.	1 ..	19	10	0	dec. 5/-
,,	2 ..	19	10	0	No change
,,	3 ..	19	10	0	,, ,,

AVERAGE MONTHLY PRICES OF WEST COAST HEMATITE MIXED NUMBERS DELIVERED SHEFFIELD.

Year	Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.	Yearly average.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1888	44 4	42 3	42 1½	42 0	41 2½	42 1½	42 6½	44 0	45 8½	44 6	44 6	45 3½	43 4
1889	44 4	45 2	47 3½	48 9½	48 6½	48 7½	50 1½	53 11	55 3	63 6	73 10	73 2	54 4½
1890	76 1½	65 1	63 3	55 1	53 9½	50 11	52 3½	56 4	58 0	58 2	57 5	54 4½	58 5
1891	52 9	50 10	48 11	47 9½	51 5	50 6	50 10	48 4	50 1	49 1½	48 3½	47 8	49 8½
1892	47 4	45 6	46 4½	47 8	49 5	50 4½	49 7½	49 10½	49 10½	48 8½	46 10	46 1½	48 2½
1893	46 0½	45 8	45 11	45 7	44 11	44 9½	44 10	45 3	45 0	44 6	44 7	45 8	45 3
1894	45 3	45 3	45 1½	45 1	43 11	43 11	43 9½	44 2	44 7½	43 7	43 5	43 3	44 3½
1895	42 8	42 5½	42 6	42 10	43 10	43 7½	44 10	45 11	49 11	48 9	47 7½	47 7½	45 2½
1896	47 0	48 9	48 9	48 2½	47 3	47 3	46 10	46 10	47 2	48 5	50 7	50 6	48 1½
1897	51 2	49 10	48 5	47 4	47 9½	48 6	47 0	47 3	47 3	47 0	48 3½	47 11	48 2
1898	48 9	48 10	49 4	49 8½	50 10	50 3½	51 0	52 5	53 11	55 8	57 3	56 10	52 1½
1899	59 1	59 9	57 7	59 6	64 7	70 10½	76 7½	72 2	74 3	75 0	78 1½	73 3	68 5
1900	75 3½	76 10	79 10	84 6	81 4	79 1½	83 4	81 5	79 11	76 10	77 8½	68 4	78 8
1901	60 2	59 0	57 9½	57 6½	57 8	57 4½	57 8	61 0	60 0½	59 9	58 7½	56 7	58 7½
1902	56 1	57 9½	59 3½	59 9	59 10½	60 0	60 0	60 8½	61 5	61 2	59 3	59 0	59 6
1903	58 5	58 8	61 1	59 5	57 10	57 3	56 7	56 3	55 9	54 8	52 4	52 4	56 8½
1904	52 8½	53 1	53 7	54 9	54 2	53 2½	52 9	52 5	52 2½	52 7	53 1	55 11½	53 5½
1905	57 9½	56 9	58 1	58 2	56 4	55 8	55 5½	56 7	61 0	68 9	69 9	70 11½	60 5½
1906	70 4½	65 2½	63 4½	63 9	64 5	64 6	64 1	66 2½	67 3	69 4½	72 4½	78 8½	67 5
1907	77 9	72 11	71 10	73 9	79 9½	76 9	77 9	78 4	75 11	72 9½	68 6	66 7	74 4
1908	62 7	59 1	61 6½	61 6½	61 4	59 1	57 9½	56 11	60 2	59 2	58 5½	57 7	59 7½
1909	51 4	56 5	55 3	56 1	56 4	57 0	56 8	58 0	61 0	61 1½	60 7½	61 4	58 1½
1910	64 0½	64 3½	66 10½	67 6½	66 2½	65 4	64 4½	65 6½	65 2	64 10½	64 6	65 6	65 4½
1911	66 9	66 1	64 10	63 1	62 1	62 0	61 2	62 2	62 1	61 1	61 10	64 0	63 1
1912	67 0	67 0	67 0	69 3	71 9½	72 11	75 9½	79 1½	82 2½	85 0	85 3½	86 6	75 9½
1913	86 6	86 6	86 3	85 0	83 6½	80 10½	78 1	76 10½	72 6	71 0	68 0	65 3	78 4½
1914	64 6	65 4½	65 6	64 11½	64 2½	64 0	64 0	68 11½	74 6½	71 0	65 4½	69 9½	66 10½
1915	78 9	100 6	103 1	113 6	111 9	114 0	116 3	115 2½	113 8½	121 1½	131 9½	139 6½	113 3
1916	135 0	135 0	133 4	127 6	127 6	127 6	127 6	127 6	127 6	127 6	127 6	127 6	129 2½
1917	127 6	127 6	127 6	127 6	127 6	127 6	127 6	127 6	127 6	127 6	127 6	127 6	127 6
1918	127 6	127 6	127 6	127 6	127 6	127 6	127 6	127 6	127 6	127 6	127 6	127 6	127 6
1919	127 6	127 6	127 6	127 6	180 6	184 3	195 4½	204 6	204 6	204 6	204 6	204 6	174 7
1920	224 9	235 0	245 0	275 0	290 0	295 0	295 0	295 0	295 0	295 0	295 0	280 0	284 11½
1921	263 4	228 4	180 0	180 0	180 0	160 0	160 0	157 6	142 0	128 6	121 0	115 6	167 9½
1922	125 0	117 6	115 0	115 0	115 0	115 0	113 1½	104 0	105 0	105 0	106 3	110 0	112 1½
1923	109 0½	116 5½	133 11½	138 3½	134 2	125 0	115 7½	111 9	110 0	110 0	113 11	115 0	119 6½
1924	115 0	115 0	114 4½	112 6	112 6	112 6	111 0	110 0	110 0	105 4½	102 6	102 6	110 8½
1925	102 6	102 6	100 0	98 6	97 6	95 1½	92 6	90 6	88 3	87 0	88 1½	88 9½	94 3½
1926	90 1½	90 0	89 8½	89 0	89 0	89 0	90 2½	91 9	94 0	97 2½	•	•	91 0
1927	95 4½	95 6	96 6	95 6	95 3	94 0	92 10½	91 6	90 6	90 6	90 6	89 6	93 1½
1928	85 0	85 3	85 5	85 0	85 3	84 9	84 0	83 9	84 0	84 0	83 1	82 6	84 4
1929	82 10½	83 6	85 0	86 9	87 0	87 0	87 3	87 2½	87 6	89 6	89 6	89 10½	86 11
1930	91 6	91 6	91 6	90 0	89 7½	88 0	87 7½	86 6	—	—	—	—	—

* No prices available.

WILLIAM JACKS & COMPANY,
WINCHESTER HOUSE, OLD BROAD ST., LONDON, E.C.2.

18, BENNETTS HILL, BIRMINGHAM.

PIG IRON

REGISTERED TRADE MARK

All grades FOUNDRY, HEMATITE, BASIC, SPECIALS, &c.

NON-FERROUS METALS

COPPER, TIN, LEAD, SPELTER, ANTIMONY, CHROME ORE.

WILLIAM JACKS & COMPANY,
19, ST. VINCENT PLACE, GLASGOW.
ZETLAND ROAD, MIDDLESBROUGH.

SMALL ADVERTISEMENTS.

SITUATIONS VACANT AND WANTED.

FOUNDRY Manager, disengaged; good organiser; experienced in mixing of metals, cupola practice, and piece-rate fixing; light or heavy casting.—Box 602, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

TRAVELLER with connection in London and South wanted for grey iron castings.—Write Box 598, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

WANTED, an Assistant Foreman Steel Moulder for large steel foundry in Calcutta. Applicants must have had at least five years in charge of a modern steel foundry producing light- and medium-weight castings on a mass-production basis. Experience with latest moulding-machine practice essential, also patternmaking. Salary Rs. 500 to Rs. 600 per month. Three years' agreement. Second-class passage out and home.—Apply, No. 10, "Advertiser" Office, Dundee.

WANTED, Foundry Manager, must be thoroughly up to date and have sound references as to organising ability and piece-rate fixing; also fully experienced in Cupola practice and mixture of metals. Reply giving all necessary particulars to Box 596, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

AGENCY.

FOUNDRYMAN (young) desires Midland Agency for First-class Foundry Stores and Equipment. Wide experience and connection. Premises available for storage, demonstration and distribution.—Box 594, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

MACHINERY.

SAND Thrower or Disintegrator wanted.—Full particulars and price, Box 600, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

ELECTRO-MAGNETIC Separator Pulley Equipment, studded-belt pattern, 4-ft. centres, dynamo 110 volts, suitable foundry sand, slag, etc. Also Alldays & Onions Blower, 12-in. outlet, good condition. £10.—Box 604, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

FOR Sale, Edge Runner Grinding Mill, pan 4 ft. 6 in. dia., under-driven; in perfect order.—J. BOOTH & SON, Congleton, Cheshire.

PRESTO RUNNER BUSH MACHINE.—A durable and efficient machine for the making of all-sized bushes up to 12 in. in foundry production. Hand-controlled, but output up to 200 per hr.—Write for further particulars to BEECROFT & PARTNERS, LIMITED, The Foundry Chemists, Sheffield.

MACHINERY—*Continued.*

SAND MIXERS. — New and Secondhand Ask us to quote.—W. BREALEY & COMPANY, LIMITED, Prospect Works, Hawksley Avenue, Sheffield.

THOS. W. WARD, LTD.

6½-in. x 6-in. BELLING & LUBKE Universal Grinding Machine.

13-in. Swing UNGER Internal Grinding Machine.

BRYANT No. 6 Chucking Grinder, chuck range 12 in.

No. 100 LUMSDEN Surface Grinder, planetary head.

Four 3-ton "SMITH" LOCO. STEAM CRANES, 33-ft. jibs; 4-ft. 8½-in. gauge; all motions; lift 3 tons at 16 ft. radius and 1½ tons at 29 ft. radius.

20-in. x 10-in. "HADFIELD" STONE-BREAKER, solid steel body; two flywheels and driving pulley.

Two LANCASHIRE BOILERS, 30 ft. 0 in. x 8 ft. 6 in., re-insure 150 lbs. pressure.

FOUNDRY LADLES, various types and sizes.

New PRESSED STEEL SECTIONAL TANKS, plates 4 ft. 0 in. or 1 metre square; all capacities; easy to erect.

(ASK FOR "ALBION" MACHINERY CATALOGUE.)

ALBION WORKS, SHEFFIELD.

NOTICE.

CITY OF LONDON.

THE SIR JOHN CASS TECHNICAL INSTITUTE.

Jewry Street, Aldgate, E.C.3.

DEPARTMENT OF METALLURGY.

The following special courses of instruction will be given during the Session 1930-31, commencing Monday, September 22, at 7 p.m.

FOUNDRY PRACTICE.

By A. F. GIBBS.

The course, which will consist of lectures, demonstrations and practical work in moulding and casting, is arranged for metallurgists and those engaged in Engineering and Foundry Work and will be of value to those interested in the production of all classes of castings.

Full particulars of the above course and also of the general courses given in the Department of Metallurgy may be obtained upon application to

GEO. PATCHIN, A.R.S.M., M.I.M.M.,
Principal.

PATENTS AND TRADE MARKS.

PROTECT YOUR IDEAS.—Free, Advice and Handbook on patenting inventions and registering trade marks by Registered Agent with 43 years' experience.—KING'S PATENT AGENCY, LIMITED, 146A, Queen Victoria Street, E.C.4.

TENDER.

CITY OF SHEFFIELD.

THE Lighting Sub-Committee of the City Council is prepared to receive Tenders for the supply of Lamp Pillars for the Lighting Department for the twelve months ending September 30, 1931.

Particulars and Form of Tender, together with "Conditions of Contract," etc., may be obtained on and after Saturday, September 6, 1930, on application to the Lighting Engineer, 42, Corporation Street, Sheffield.

Tenders to be enclosed in the official envelope provided, endorsed "Tender for Lamp Pillars," and delivered not later than Saturday, September 13, 1930.

The Committee do not bind themselves to accept any Tender.

Any person or firm sending in a Tender will be required to add a schedule to such Tender stating the names of the various classes of labour which he or they intend to employ, together with the places where such labour will be employed, and the rate of wages, hours of labour and the conditions of employment to be paid and observed in respect of each class of labour, all of which as shown in such schedule shall comply with the City Council's form of clauses respecting wages, hours, and conditions of labour, and prohibition against assigning or sub-letting, a copy of which in the "Conditions of Contract" will be furnished with the Form of Tender.

J. F. COLQUHOUN,
Lighting Engineer.

Public Lighting Engineer's Office,
42, Corporation Street, Sheffield.
September 1, 1930.

MISCELLANEOUS.

GANISTER, best quality for cupolas, also for Steel Works.—ASTBURY SILICA COMPANY, "The Brooms," Park Lane, Congleton.

'Phone: 287 SLOUGH

SANDBLAST PLANTS

12′×9′ Room Plant, complete with compressor and all equipment **£340**

Large Barrel Plant, suitable for castings up to 20 lb. weight, complete with compressor and all equipment **£180**

Cabinet Plant, complete with vertical compressor and all equipment **£60**

ABOVE ARE IN STOCK, ready for use.

LARGEST STOCK OF FOUNDRY PLANT IN ENGLAND. PLEASE SEND FOR LISTS.

BUY FROM ME AND SAVE MONEY

ALEX. HAMMOND, *Foundry Machinery Merchant,*
14, AUSTRALIA ROAD, SLOUGH

LOW ASH COKE

GUARANTEED LESS THAN 5%

Made by

PEASE & PARTNERS LTD., DARLINGTON

Ash	<	5·0%	Strength	>	80% over 2″
Sulphur	<	0·70%	Fusion	>	1,500° C
Phos.	<	0·005%	Cal. Val.	>	13,000 B.Th.U.